Quantis and Virtualization

Version 20130626

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Revision History

26.06.2013

- First version of the document

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Chapter 1. Introduction

Virtualization has become widely used in many different fields of application. However, when hardware devices are to be virtualized, things can become a little complicated. This white-paper discusses how to set up virtualization of the Quantis USB and the Quantis-PCI/PCIe.

Since many virtualization solutions are available on the market, this document will only focus on a subset of solutions, while the principle remains the same for the other solutions.

A good comparison chart of the different solutions is available on wikipedia: `http://en.wikipedia.org/wiki/Comparison_of_platform_virtual_machines`

1.1. Requirements

Some solutions for virtualization can't be used with Quantis since it requires some features to be run which are not available in all virtualization solutions:

- Quantis-USB requires **USB 2.0** support
- Quantis-PCI/PCIe requires **PCI-passthrough** support

The list of supported features may be checked here:

`http://en.wikipedia.org/wiki/Comparison_of_platform_virtual_machines#Other_features`

The virtualization of the USB device is easier to setup than that of the PCI/PCIe version.

1.2. Resource sharing

Basically, when using the virtualization, a resource (in our case the Quantis) is allocated to a dedicated virtual machine. It is not possible to share a Quantis in multiple virtual machines. However, there are some workarounds:

- **Non concurrent use**: A Quantis may be passed from one virtual machine to an another.
- **Concurrent use**: A Quantis is dedicated to a virtual machine. This virtual machine provides a random number server for the other virtual machines.

1.2.1. Non concurrent use

In this use case, the Quantis must be disconnected from a virtual machine prior being reconnected to a new virtual machine. USB devices may be connected and disconnected at runtime. PCI/PCIe devices require the hypervisor to be reboot. Therefore, in many situations this use case may be not applicable.

1.2.2. Concurrent use

In this use case the Quantis is connected to a dedicated virtual machine. This VM performs the acquisition of the random numbers and makes them available to other virtual machines though a server. Since the requirements for such a server may vary from an application to an other, IDQuantique does not provide such a service.

Chapter 2. Quantis-USB

This section explains how to install a Quantis-USB under:

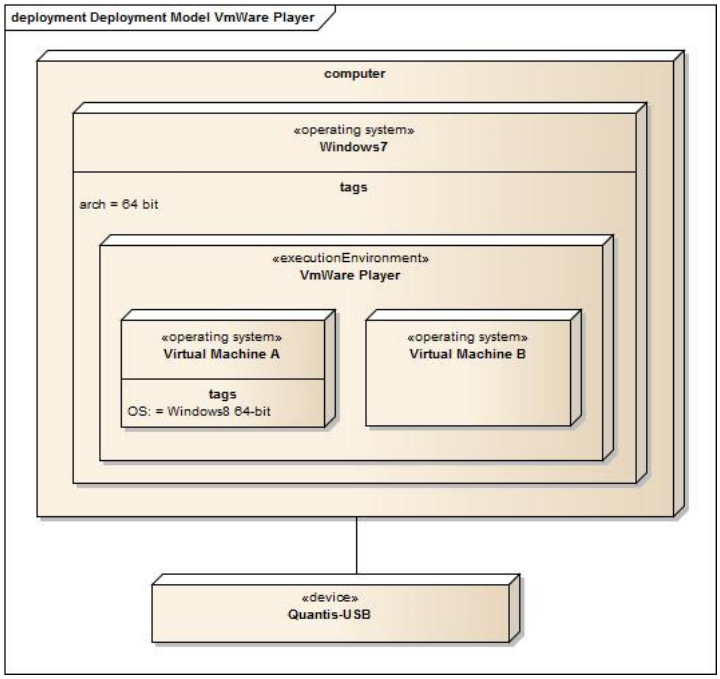
- VMware Player
- Oracle VirtualBox

2.1. VMware Player

VMware offers VMware Player free for non-commercial use, or as a free evaluation for VMware Workstation. Check the VMware web site for details.

In this example the setup is:

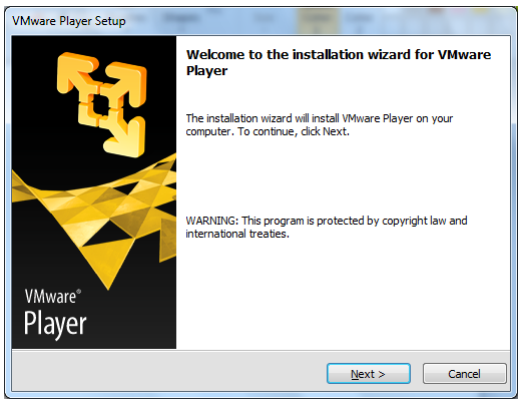
- Host OS: Windows7 SP1 64-bit
- Guest OS: Windows8 64-bit
- VMware Player 5.0.2



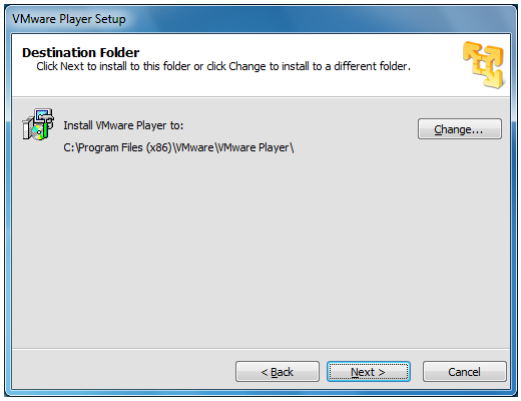
The host operating system installation (Win7) is not described here.

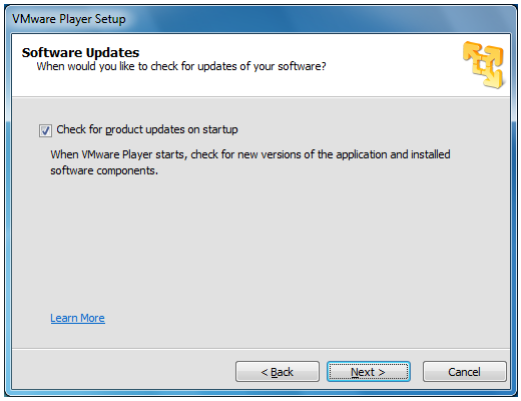
2.1.1. VMware Player installation

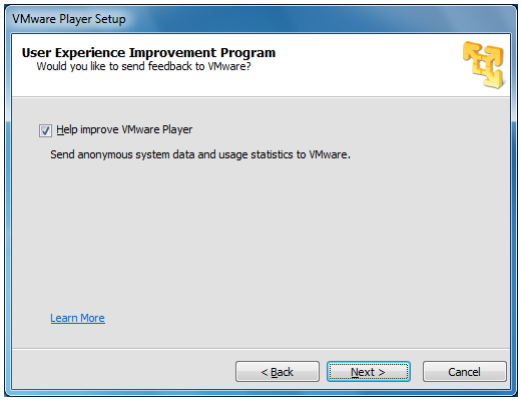
Download *VMware-player-5.0.2-1031769.exe* from the VMware website.

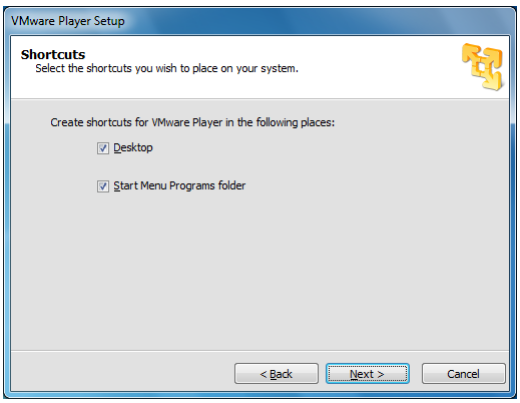

VMware Player Setup
Welcome to the installation wizard for VMware Player
The installation wizard will install VMware Player on your computer. To continue, click Next.
WARNING: This program is protected by copyright law and international treaties.
VMware®
Player
Next >
Cancel

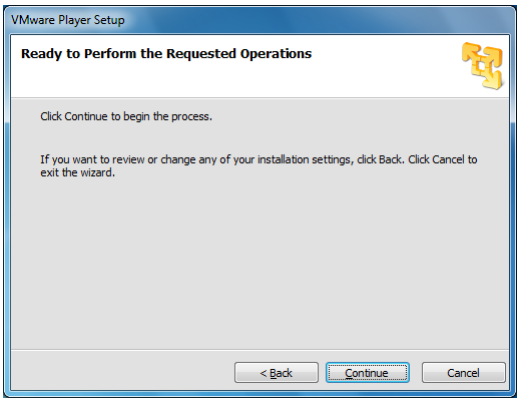
The installation is quite straightforward. Click *Next* to validate the default settings.


VMware Player Setup
Destination Folder
Click Next to install to this folder or click Change to install to a different folder.
Install VMware Player to:
C:\Program Files (x86)\VMware\VMware Player\
Change...
< Back
Next >
Cancel

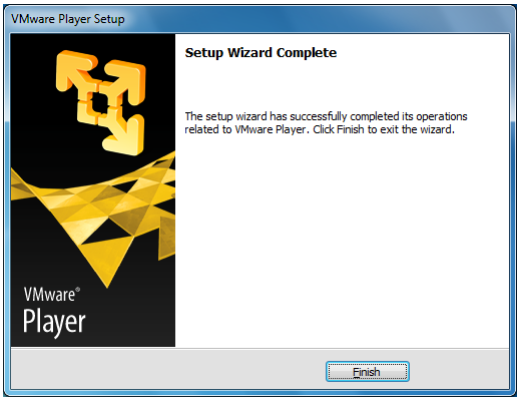

VMware Player Setup
Software Updates
When would you like to check for updates of your software?
Check for product updates on startup
When VMware Player starts, check for new versions of the application and installed software components.
Learn More
< Back
Next >
Cancel


VMware Player Setup
User Experience Improvement Program
Would you like to send feedback to VMware?
Help improve VMware Player
Send anonymous system data and usage statistics to VMware.
Learn More
< Back
Next >
Cancel


VMware Player Setup
Shortcuts
Select the shortcuts you wish to place on your system.
Create shortcuts for VMware Player in the following places:
Desktop
Start Menu Programs folder
< Back
Next >
Cancel


VMware Player Setup
Ready to Perform the Requested Operations
Click Continue to begin the process.
If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.
< Back
Continue
Cancel

Click *Continue* to start the installation.


VMware Player Setup
Setup Wizard Complete
The setup wizard has successfully completed its operations related to VMware Player. Click Finish to exit the wizard.
VMware®
Player
Finish

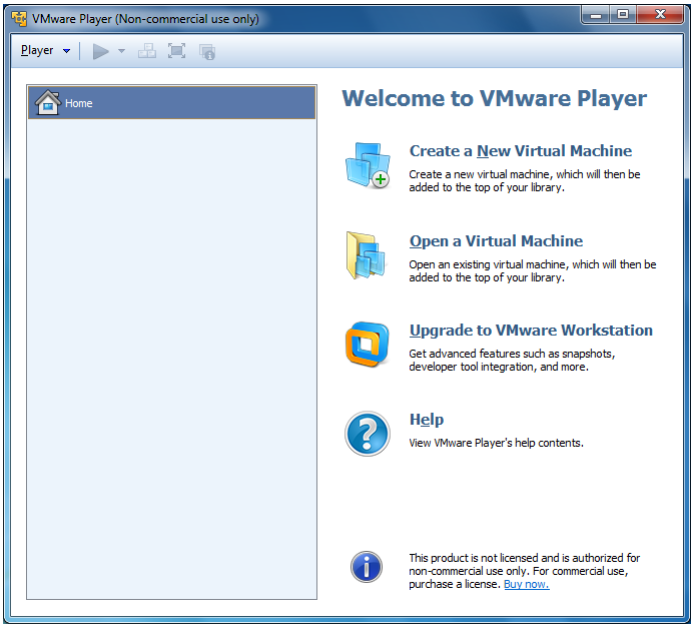
Finally click *Finish*.

2.1.2. Create a virtual machine

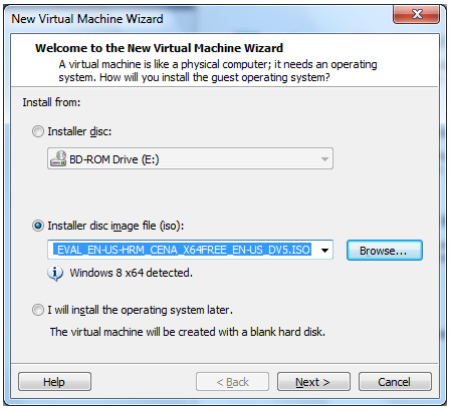
To create a new virtual machine, start VMware Player.

VMware Player
License Agreement
Please read the following license agreement carefully.
VMWARE END USER LICENSE AGREEMENT
IMPORTANT-READ CAREFULLY: BY DOWNLOADING, INSTALLING, OR USING THE SOFTWARE, YOU (THE INDIVIDUAL OR LEGAL ENTITY) AGREE TO BE BOUND BY THE TERMS OF THIS END USER LICENSE AGREEMENT ("EULA"). IF YOU DO NOT AGREE TO THE TERMS OF THIS EULA, YOU MUST NOT DOWNLOAD, INSTALL, OR USE THE SOFTWARE, AND YOU MUST DELETE OR RETURN THE UNUSED SOFTWARE TO THE VENDOR FROM WHICH YOU ACQUIRED IT WITHIN THIRTY (30) DAYS AND REQUEST A REFUND OF THE LICENSE FEE, IF ANY, THAT YOU PAID FOR THE SOFTWARE.
Yes, I accept the terms in the license agreement
No, I do not accept the terms in the license agreement
OK

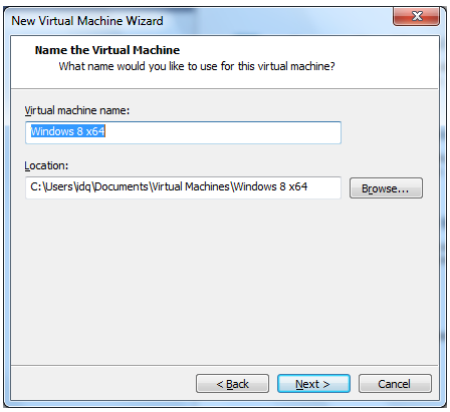
At first launch you must accept the license conditions.


VMware Player (Non-commercial use only)
Player
Home
Welcome to VMware Player
Create a New Virtual Machine
Create a new virtual machine, which will then be added to the top of your library.
Open a Virtual Machine
Open an existing virtual machine, which will then be added to the top of your library.
Upgrade to VMware Workstation
Get advanced features such as snapshots, developer tool integration, and more.
Help
View VMware Player's help contents.
This product is not licensed and is authorized for non-commercial use only. For commercial use, purchase a license. Buy now.

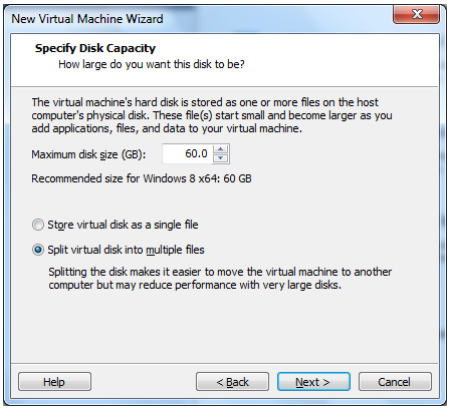
Click *Create a New Virtual Machine*.


New Virtual Machine Wizard
Welcome to the New Virtual Machine Wizard
A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?
Install from:
Installer disc:
BD-ROM Drive (E:)
Installer disc image file (iso):
EVAL_EN-US-HRM_CENA_X64FREE_EN-US_DV5.ISO
Browse...
Windows 8 x64 detected.
I will install the operating system later.
The virtual machine will be created with a blank hard disk.
Help
< Back
Next >
Cancel

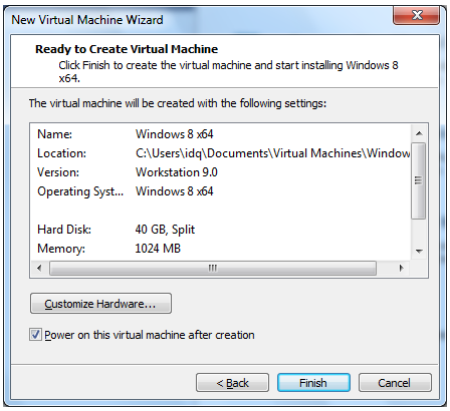
Select either *Installer disc* if you have a CD-Rom or *Installer disc image file (iso)* if you have the guest OS as an iso file. Click *Next*.



Enter a name and a path for the virtual machine. Click *Next*.


New Virtual Machine Wizard
Specify Disk Capacity
How large do you want this disk to be?
The virtual machine's hard disk is stored as one or more files on the host computer's physical disk. These file(s) start small and become larger as you add applications, files, and data to your virtual machine.
Maximum disk size (GB):
60.0
Recommended size for Windows 8 x64: 60 GB
Store virtual disk as a single file
Split virtual disk into multiple files
Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.
Help
< Back
Next >
Cancel

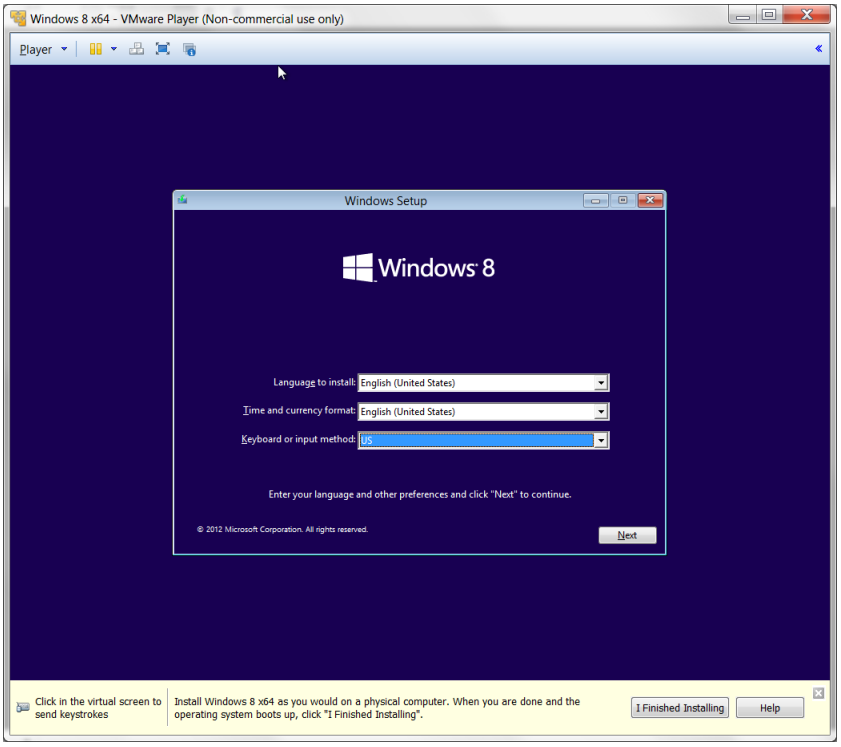
Specify the hard disk size dedicated to the virtual machine. The default settings are dependent on the guest OS. Accept the default value. Click *Next*.


New Virtual Machine Wizard
Ready to Create Virtual Machine
Click Finish to create the virtual machine and start installing Windows 8 x64.
The virtual machine will be created with the following settings:
Name: Windows 8 x64
Location: C:\Users\idq\Documents\Virtual Machines\Window
Version: Workstation 9.0
Operating Syst... Windows 8 x64
Hard Disk: 40 GB, Split
Memory: 1024 MB
Customize Hardware...
Power on this virtual machine after creation
< Back
Finish
Cancel

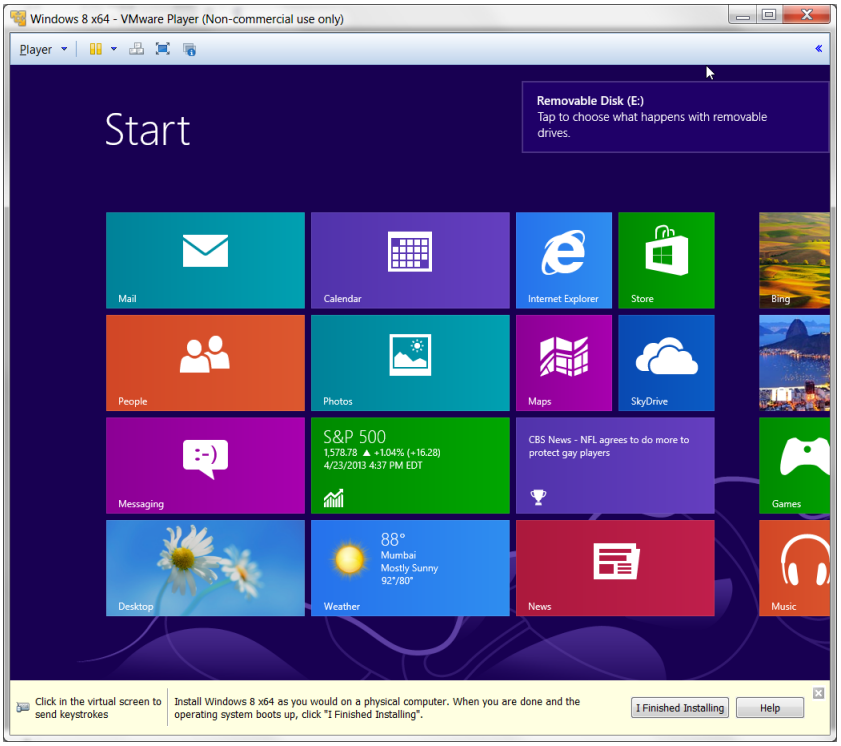
Review the settings and click *Finish* to start the installation.

2.1.3. Install the guest operating system

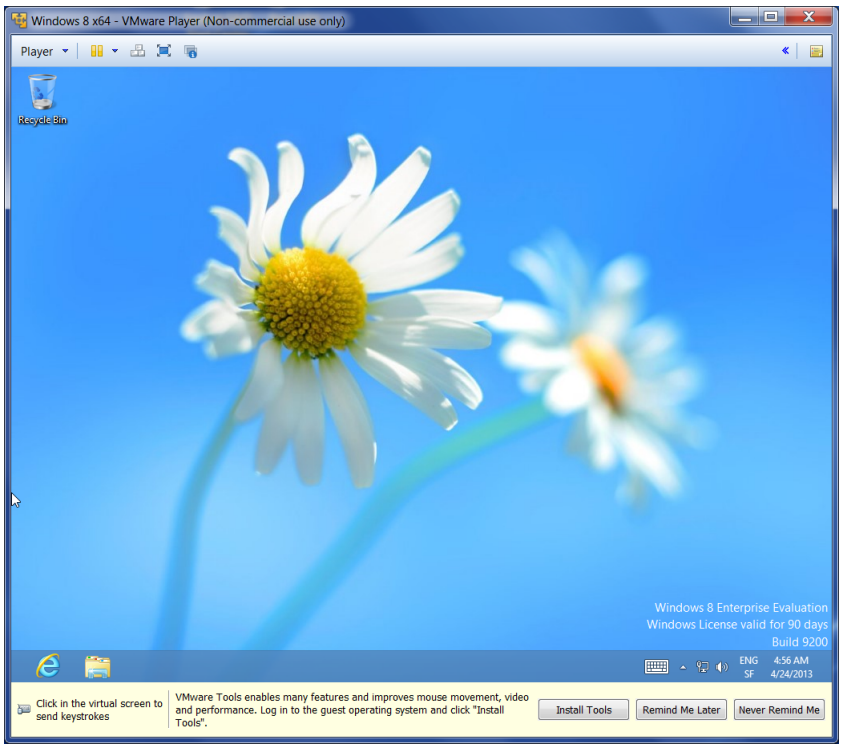
The installation should start automatically


Windows 8 x64 - VMware Player (Non-commercial use only)
Player
Windows Setup
Windows 8
Language to install: English (United States)
Time and currency format: English (United States)
Keyboard or input method: US
Enter your language and other preferences and click "Next" to continue.
© 2012 Microsoft Corporation. All rights reserved.
Next
Click in the virtual screen to send keystrokes
Install Windows 8 x64 as you would on a physical computer. When you are done and the operating system boots up, click "I Finished Installing".
I Finished Installing
Help

Install the guest operating system as you would do on a physical computer.

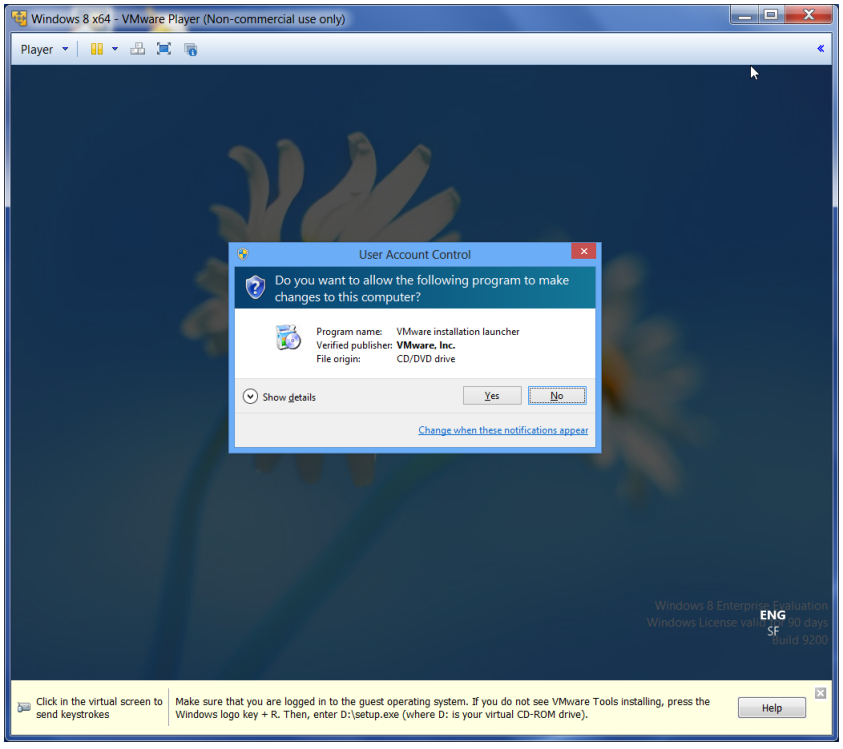


Finally, when the installation is done, click *I Finished Installing*.

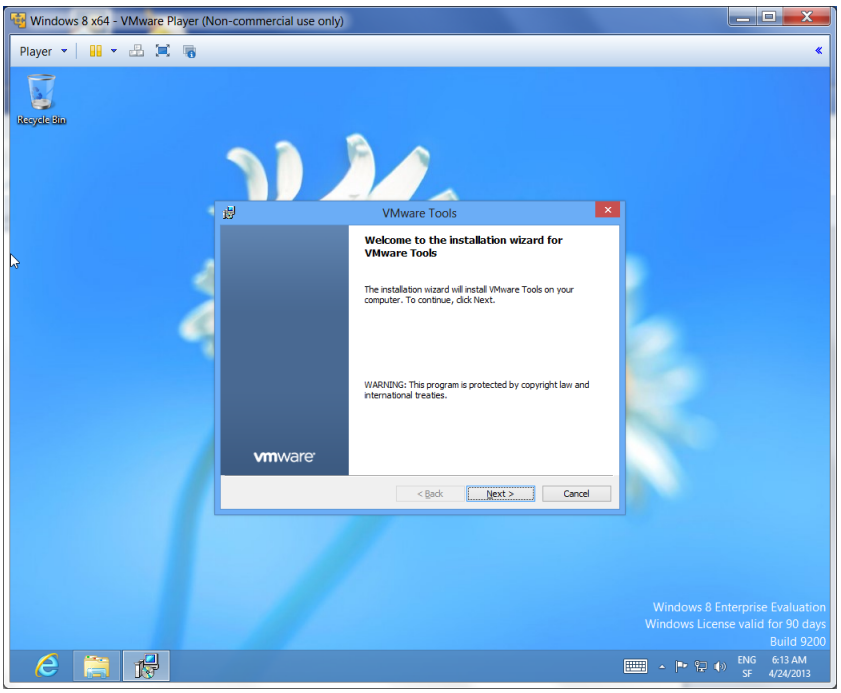

Windows 8 x64 - VMware Player (Non-commercial use only)
Player
Recycle Bin
Windows 8 Enterprise Evaluation
Windows License valid for 90 days
Build 9200
ENG
SF
4:56 AM
4/24/2013
Click in the virtual screen to send keystrokes
VMware Tools enables many features and improves mouse movement, video and performance. Log in to the guest operating system and click "Install Tools".
Install Tools
Remind Me Later
Never Remind Me

2.1.4. Install VMwareTools

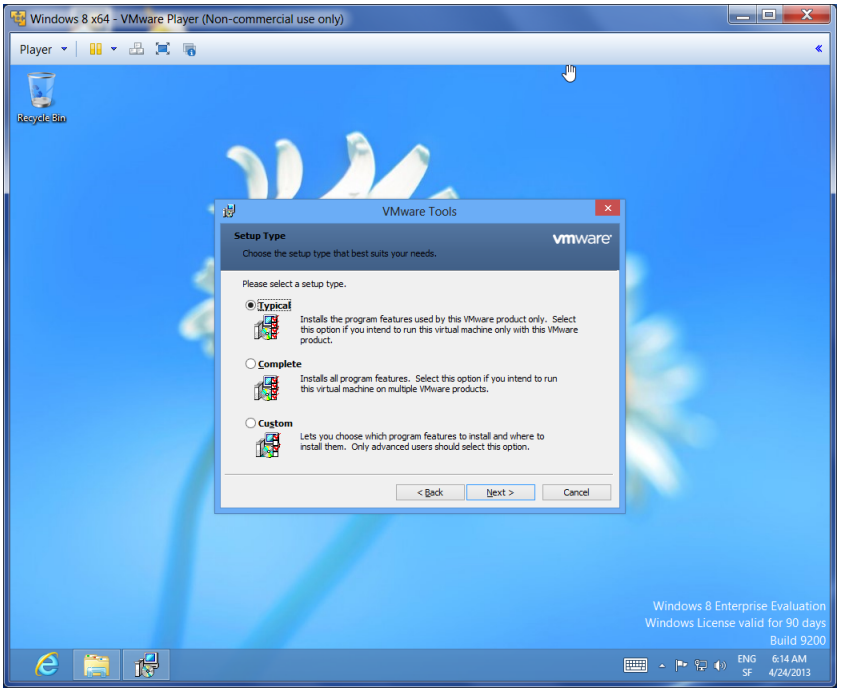
VMware Player will propose to install some tools to enable extra features and improve performance. Click *Install Tool* from the yellow ribbon or from the menu *Player*, *Manage*, *Install VMware Tools*. If the installation does not start automatically you can run *setup.exe* from the CD-Rom.


Windows 8 x64 - VMware Player (Non-commercial use only)
Player
User Account Control
Do you want to allow the following program to make changes to this computer?
Program name: VMware installation launcher
Verified publisher: VMware, Inc.
File origin: CD/DVD drive
Show details
Yes
No
Change when these notifications appear
ENG
SF
Click in the virtual screen to send keystrokes
Make sure that you are logged in to the guest operating system. If you do not see VMware Tools installing, press the Windows logo key + R. Then, enter D:\setup.exe (where D: is your virtual CD-ROM drive).
Help

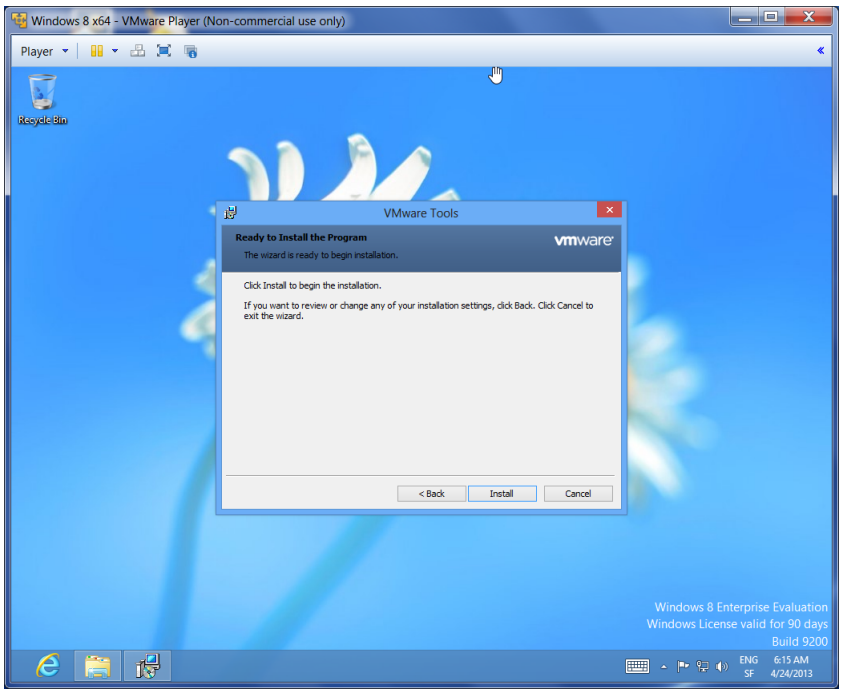
Click *Yes* to allow the installation to run.


Windows 8 x64 - VMware Player (Non-commercial use only)
Player
Recycle Bin
VMware Tools
Welcome to the installation wizard for VMware Tools
The installation wizard will install VMware Tools on your computer. To continue, click Next.
WARNING: This program is protected by copyright law and international treaties.
vmware
< Back
Next >
Cancel
Windows 8 Enterprise Evaluation
Windows License valid for 90 days
Build 9200
ENG
SF
6:13 AM
4/24/2013

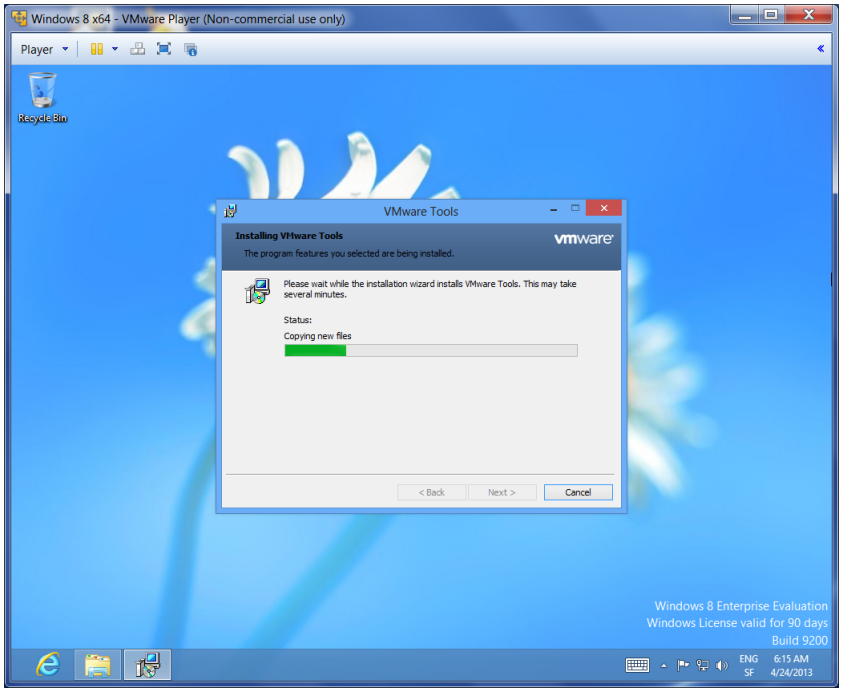
The installation wizard will start. Click *Next*.


Windows 8 x64 - VMware Player (Non-commercial use only)
Player
Recycle Bin
VMware Tools
Setup Type
Choose the setup type that best suits your needs.
vmware
Please select a setup type.
Typical
Installs the program features used by this VMware product only. Select this option if you intend to run this virtual machine only with this VMware product.
Complete
Installs all program features. Select this option if you intend to run this virtual machine on multiple VMware products.
Custom
Lets you choose which program features to install and where to install them. Only advanced users should select this option.
< Back
Next >
Cancel
Windows 8 Enterprise Evaluation
Windows License valid for 90 days
Build 9200
ENG
SF
6:14 AM
4/24/2013

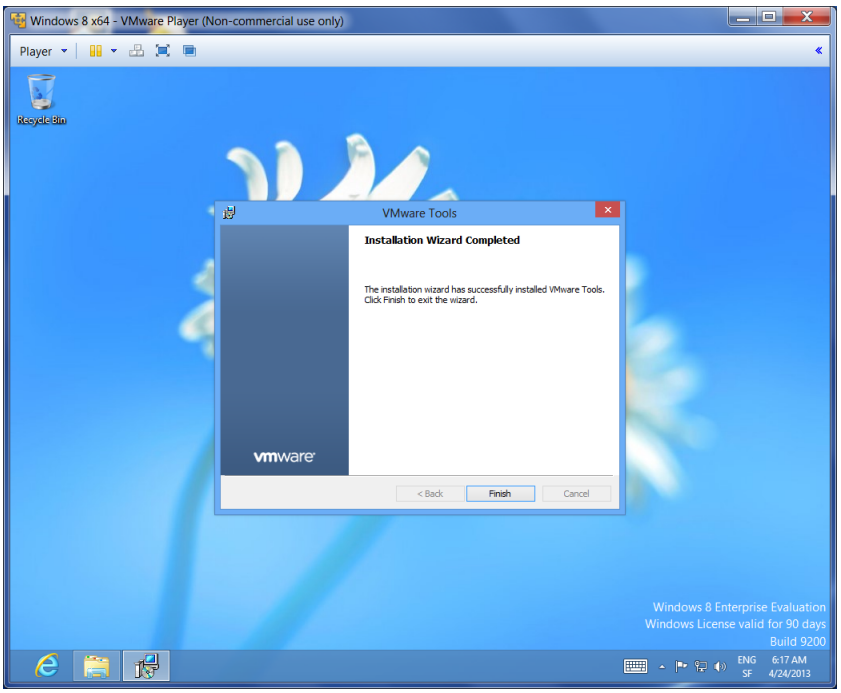
Choose *Typical* setup. Click *Next*.



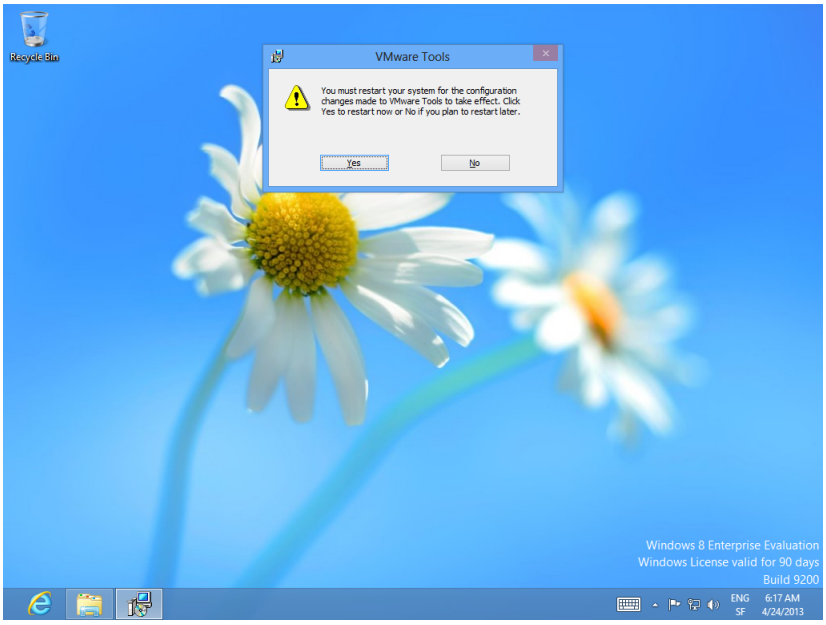
Click *Next* to start the installation of VMware Tools.



Wait during the installation...



Click *Finish* to quit the wizard.


Recycle Bin
VMware Tools
You must restart your system for the configuration changes made to VMware Tools to take effect. Click Yes to restart now or No if you plan to restart later.
Yes
No
Windows 8 Enterprise Evaluation
Windows License valid for 90 days
Build 9200
ENG
SF
6:17 AM
4/24/2013

Finally reboot the guest operating system by clicking *Yes*.

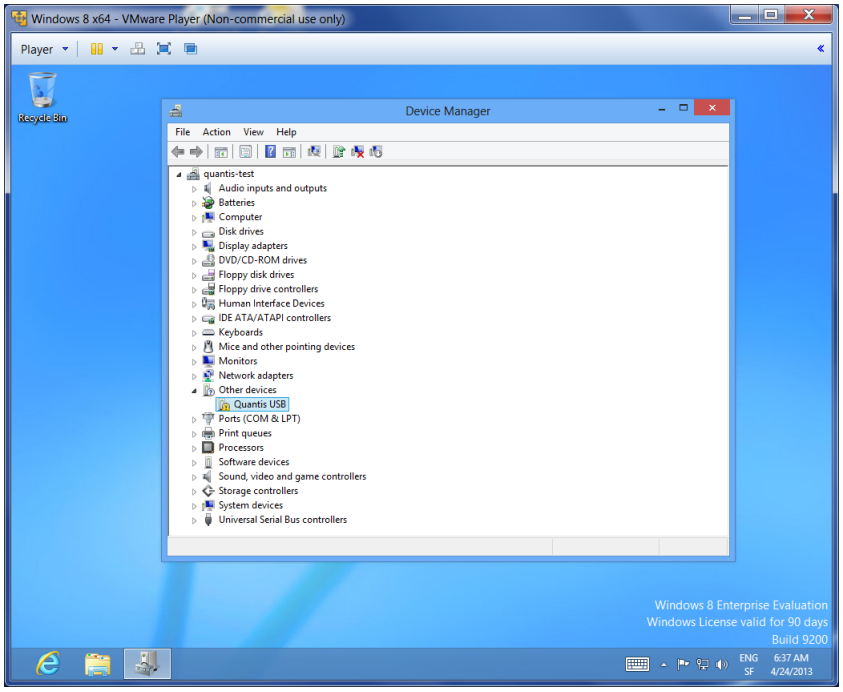
2.1.5. Connect Quantis-USB

After the reboot, connect the Quantis-USB device to the computer if it is not already connected.

The Quantis-USB must be attached to the virtual machine. For this click on the menu *Player, Removable Devices, Ellisys Quantis USB, Connect*.

Windows 8 x64 - VMware Player
A USB device is about to be unplugged from the host and connected to this virtual machine. It will first be stopped to enable safe removal. With some devices, the host may display the message "The device can now safely be removed."
Do not show this message again
OK
Cancel

VMware warns you about Quantis-USB being unplugged from the host OS device and getting attached to the guest OS. Click *OK*.



Finally Open the *Device Manager* in the *Control Panel*. The Quantis-USB must be listed under *Other devices*. From this point the driver may be installed as described in the *Quantis User Manual*.

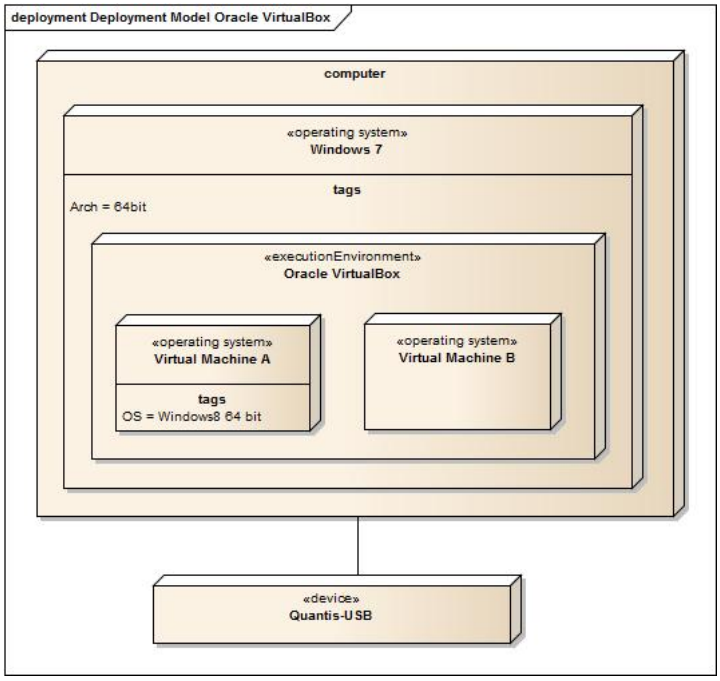
2.2. Oracle VirtualBox

Oracle VirtualBox is available in 2 versions:

- **VirtualBox-OSE** (Open Source Edition) with a GPL-v2 License. This version can **NOT** be used with Quantis-USB since it does not support USB 2.0. You must install the VirtualBox-PUEL extension pack on top of it to enable this functionality.
- **VirtualBox-PUEL** (Personal Use and Evaluation License). This version can be used with Quantis-USB since it supports USB 2.0.

In this example the setup is:

- Host OS: Windows7 SP1 64-bit
- Guest OS: Windows8 64-bit
- Oracle VirtualBox 4.2.12



The host operating system installation (Win7) is not described here.

2.2.1. VirtualBox installation

Download the following two files from :`www.virtualbox.org`

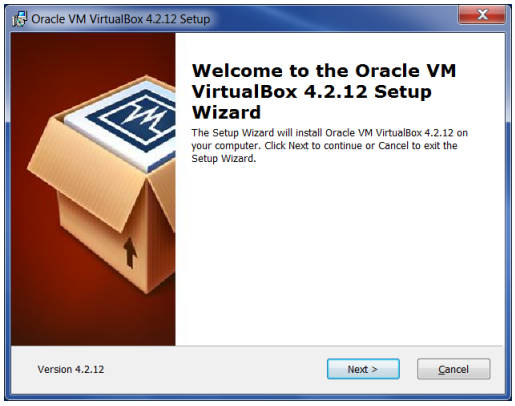
- **VirtualBox platform packages** for Windows, *(VirtualBox-4.2.12-84980-Win.exe*)

  This file is the VirtualBox-OSE.

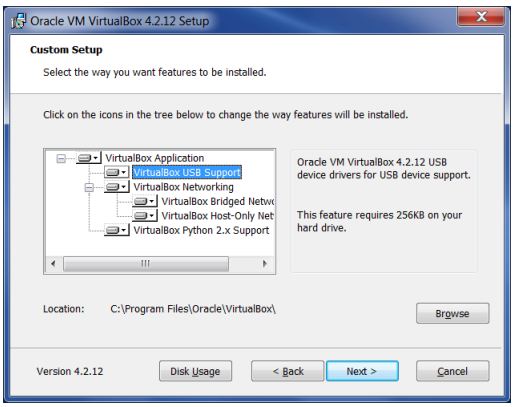
- **VirtualBox 4.2.12 Oracle VM VirtualBox Extension Pack**, *Oracle_VM_VirtualBox_Extension_Pack-4.2.12-84980.vbox-extpack*

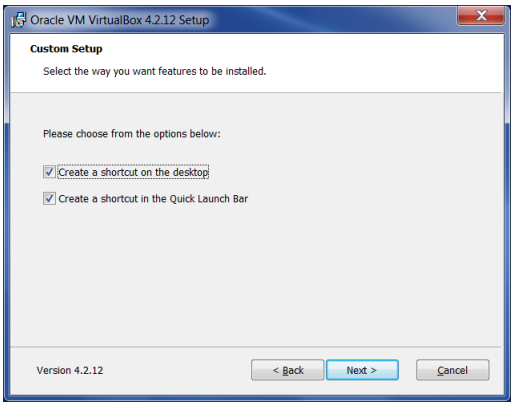
  This file is the extension pack VirtualBox-PUEL.

Start the installation of VirtualBox-OSE


Oracle VM VirtualBox 4.2.12 Setup
Welcome to the Oracle VM VirtualBox 4.2.12 Setup Wizard
The Setup Wizard will install Oracle VM VirtualBox 4.2.12 on your computer. Click Next to continue or Cancel to exit the Setup Wizard.
Version 4.2.12
Next >
Cancel

Click *Next* to start the wizard.

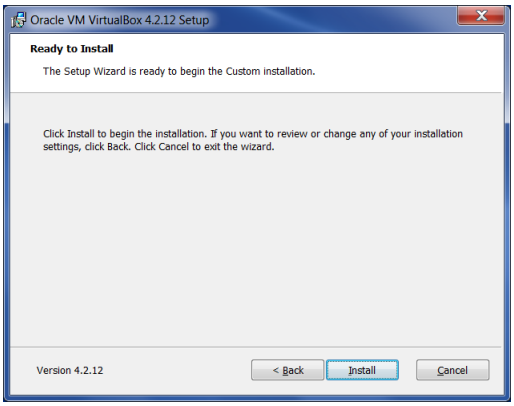

Oracle VM VirtualBox 4.2.12 Setup
Custom Setup
Select the way you want features to be installed.
Click on the icons in the tree below to change the way features will be installed.
VirtualBox Application
VirtualBox USB Support
VirtualBox Networking
VirtualBox Bridged Netw
VirtualBox Host-Only Net
VirtualBox Python 2.x Support
Oracle VM VirtualBox 4.2.12 USB device drivers for USB device support.
This feature requires 256KB on your hard drive.
Location:
C:\Program Files\Oracle\VirtualBox\
Browse
Version 4.2.12
Disk Usage
< Back
Next >
Cancel


Oracle VM VirtualBox 4.2.12 Setup
Custom Setup
Select the way you want features to be installed.
Please choose from the options below:
Create a shortcut on the desktop
Create a shortcut in the Quick Launch Bar
Version 4.2.12
< Back
Next >
Cancel

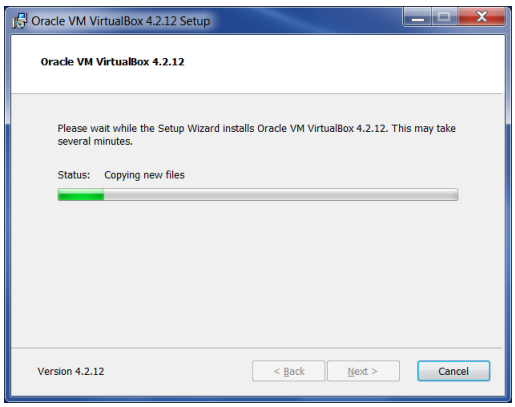
Click *Next* to accept the default settings.

Oracle VM VirtualBox 4.2.12
Warning:
Network Interfaces
Installing the Oracle VM VirtualBox 4.2.12 Networking feature will reset your network connection and temporarily disconnect you from the network.
Proceed with installation now?
Version 4.2.12
Yes
No

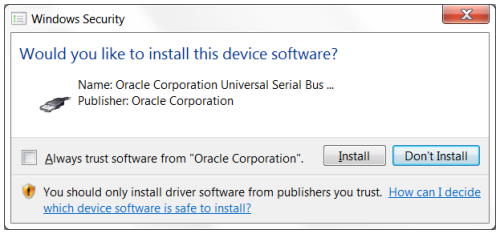
The network interfaces will be disconnected for a short time. Click *Yes* to continue.

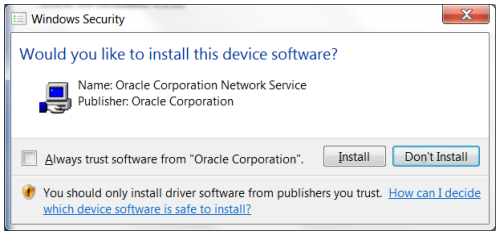

Oracle VM VirtualBox 4.2.12 Setup
Ready to Install
The Setup Wizard is ready to begin the Custom installation.
Click Install to begin the installation. If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.
Version 4.2.12
< Back
Install
Cancel

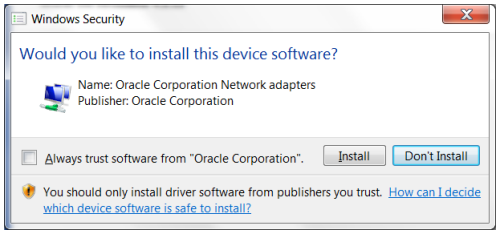
Click *Install*


Oracle VM VirtualBox 4.2.12 Setup
Oracle VM VirtualBox 4.2.12
Please wait while the Setup Wizard installs Oracle VM VirtualBox 4.2.12. This may take several minutes.
Status: Copying new files
Version 4.2.12
< Back
Next >
Cancel

Wait during the installation...


Windows Security
Would you like to install this device software?
Name: Oracle Corporation Universal Serial Bus ...
Publisher: Oracle Corporation
Always trust software from "Oracle Corporation".
Install
Don't Install
You should only install driver software from publishers you trust. How can I decide which device software is safe to install?


Windows Security
Would you like to install this device software?
Name: Oracle Corporation Network Service
Publisher: Oracle Corporation
Always trust software from "Oracle Corporation".
Install
Don't Install
You should only install driver software from publishers you trust. How can I decide which device software is safe to install?

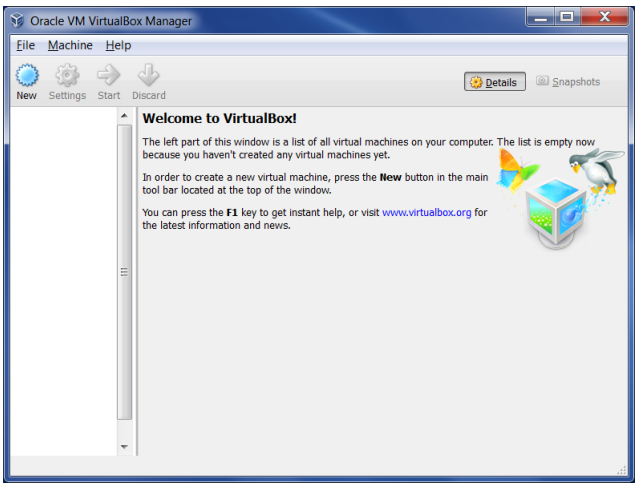

Windows Security
Would you like to install this device software?
Name: Oracle Corporation Network adapters
Publisher: Oracle Corporation
Always trust software from "Oracle Corporation".
Install
Don't Install
You should only install driver software from publishers you trust. How can I decide which device software is safe to install?

Click *Install* to add USB and network drivers.

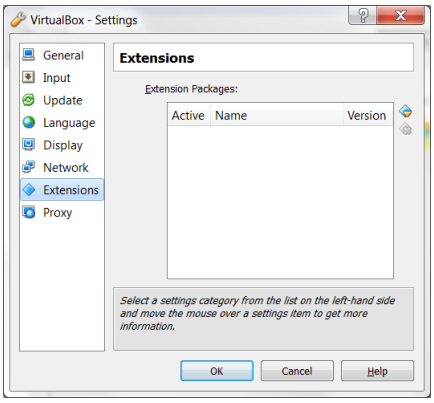
Oracle VM VirtualBox 4.2.12 Setup
Oracle VM VirtualBox 4.2.12 installation is complete.
Click the Finish button to exit the Setup Wizard.
Start Oracle VM VirtualBox 4.2.12 after installation
Version 4.2.12
< Back
Finish
Cancel

VirtualBox OSE is installed once you click finish.

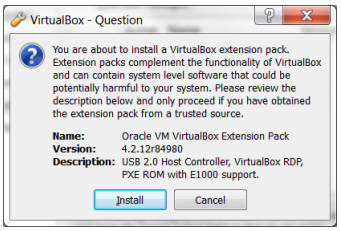
Now install the PUEL extension.


Oracle VM VirtualBox Manager
File Machine Help
New Settings Start Discard
Details Snapshots
Welcome to VirtualBox!
The left part of this window is a list of all virtual machines on your computer. The list is empty now because you haven't created any virtual machines yet.
In order to create a new virtual machine, press the New button in the main tool bar located at the top of the window.
You can press the F1 key to get instant help, or visit www.virtualbox.org for the latest information and news.

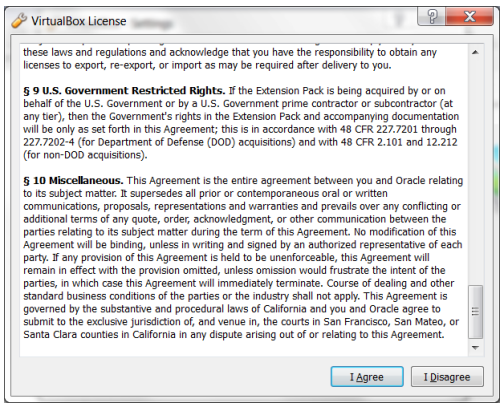
Click Menu *File*, *Preferences...*



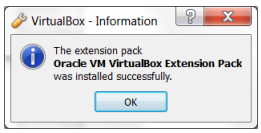
Select *Extensions* and click the blue icon close to the label *Version* to add a package.


VirtualBox - Question
You are about to install a VirtualBox extension pack. Extension packs complement the functionality of VirtualBox and can contain system level software that could be potentially harmful to your system. Please review the description below and only proceed if you have obtained the extension pack from a trusted source.
Name: Oracle VM VirtualBox Extension Pack
Version: 4.2.12r84980
Description: USB 2.0 Host Controller, VirtualBox RDP, PXE ROM with E1000 support.
Install Cancel

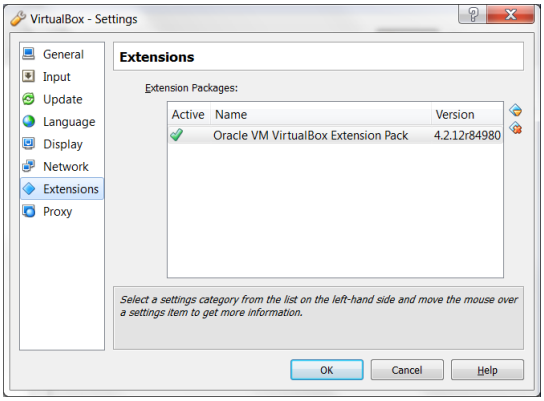
Click *Install* to continue.


VirtualBox License
these laws and regulations and acknowledge that you have the responsibility to obtain any licenses to export, re-export, or import as may be required after delivery to you.
§ 9 U.S. Government Restricted Rights. If the Extension Pack is being acquired by or on behalf of the U.S. Government or by a U.S. Government prime contractor or subcontractor (at any tier), then the Government's rights in the Extension Pack and accompanying documentation will be only as set forth in this Agreement; this is in accordance with 48 CFR 227.7201 through 227.7202-4 (for Department of Defense (DOD) acquisitions) and with 48 CFR 2.101 and 12.212 (for non-DOD acquisitions).
§ 10 Miscellaneous. This Agreement is the entire agreement between you and Oracle relating to its subject matter. It supersedes all prior or contemporaneous oral or written communications, proposals, representations and warranties and prevails over any conflicting or additional terms of any quote, order, acknowledgment, or other communication between the parties relating to its subject matter during the term of this Agreement. No modification of this Agreement will be binding, unless in writing and signed by an authorized representative of each party. If any provision of this Agreement is held to be unenforceable, this Agreement will remain in effect with the provision omitted, unless omission would frustrate the intent of the parties, in which case this Agreement will immediately terminate. Course of dealing and other standard business conditions of the parties or the industry shall not apply. This Agreement is governed by the substantive and procedural laws of California and you and Oracle agree to submit to the exclusive jurisdiction of, and venue in, the courts in San Francisco, San Mateo, or Santa Clara counties in California in any dispute arising out of or relating to this Agreement.
I Agree I Disagree

Scroll down to enable the buttons. Click *I Agree* to continue.



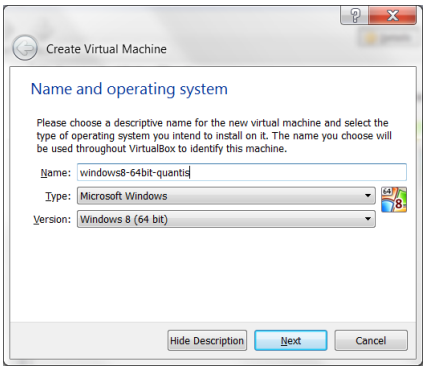
When the installation is complete, click *OK*.



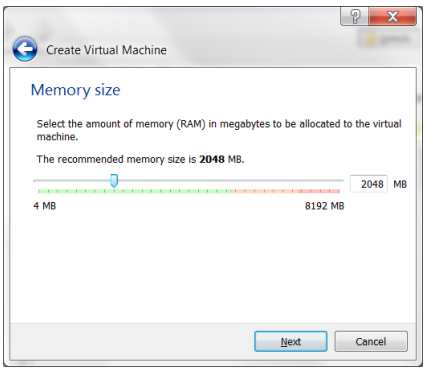
Finally the package appears in the list. Click *OK* to close the preferences windows.

2.2.2. Create a virtual machine

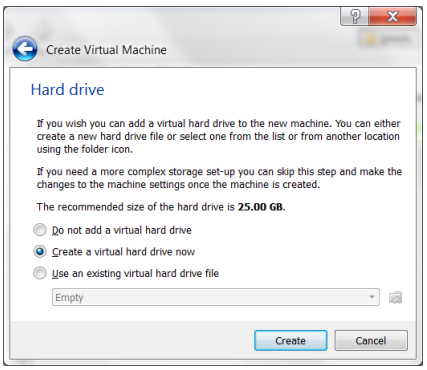
To create a new virtual machine click *New* to start the wizard.


Create Virtual Machine
Name and operating system
Please choose a descriptive name for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.
Name:
windows8-64bit-quantis
Type:
Microsoft Windows
Version:
Windows 8 (64 bit)
Hide Description
Next
Cancel

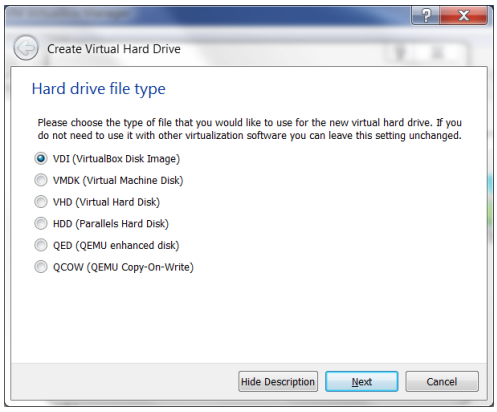
Enter a *Name*, select *Microsoft Windows* and *Windows 8 (64-bit)*.

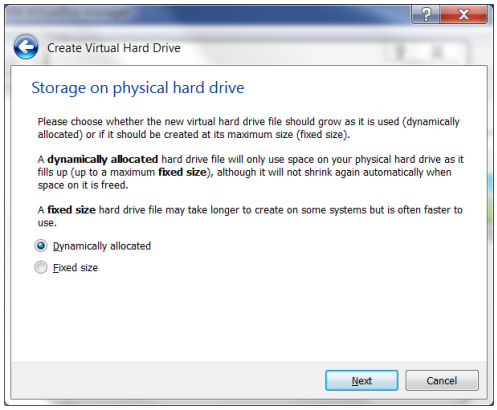


Click *Next* to accept the default memory size.

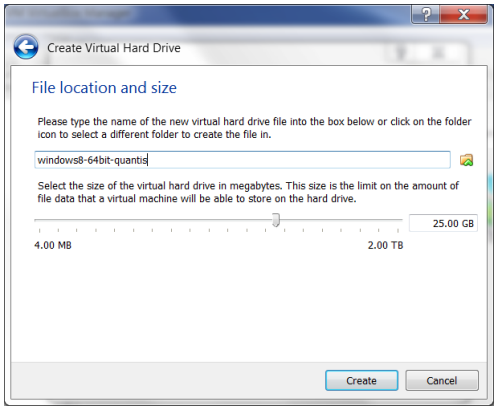

Create Virtual Machine
Hard drive
If you wish you can add a virtual hard drive to the new machine. You can either create a new hard drive file or select one from the list or from another location using the folder icon.
If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.
The recommended size of the hard drive is 25.00 GB.
Do not add a virtual hard drive
Create a virtual hard drive now
Use an existing virtual hard drive file
Empty
Create
Cancel

Click *Create* to setup the hard drive.

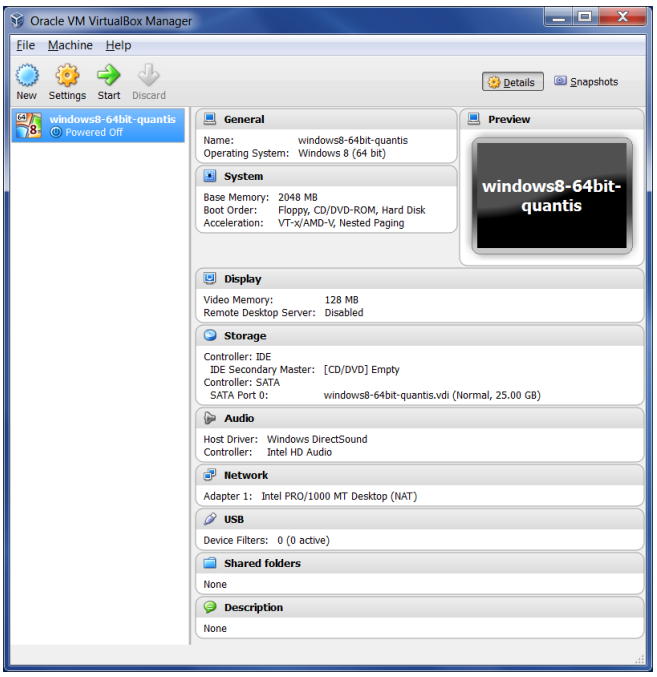

Create Virtual Hard Drive
Hard drive file type
Please choose the type of file that you would like to use for the new virtual hard drive. If you do not need to use it with other virtualization software you can leave this setting unchanged.
VDI (VirtualBox Disk Image)
VMDK (Virtual Machine Disk)
VHD (Virtual Hard Disk)
HDD (Parallels Hard Disk)
QED (QEMU enhanced disk)
QCOW (QEMU Copy-On-Write)
Hide Description
Next
Cancel


Create Virtual Hard Drive
Storage on physical hard drive
Please choose whether the new virtual hard drive file should grow as it is used (dynamically allocated) or if it should be created at its maximum size (fixed size).
A dynamically allocated hard drive file will only use space on your physical hard drive as it fills up (up to a maximum fixed size), although it will not shrink again automatically when space on it is freed.
A fixed size hard drive file may take longer to create on some systems but is often faster to use.
Dynamically allocated
Fixed size
Next
Cancel

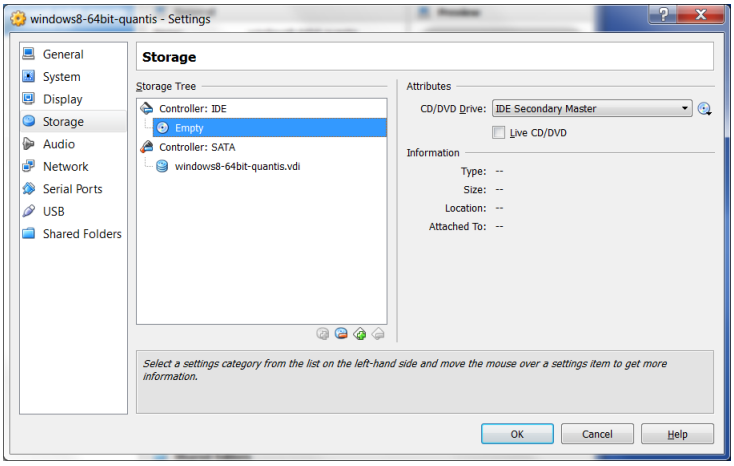
Click *Next* to accept the default hard drive file type and storage.


Create Virtual Hard Drive
File location and size
Please type the name of the new virtual hard drive file into the box below or click on the folder icon to select a different folder to create the file in.
windows8-64bit-quantis
Select the size of the virtual hard drive in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard drive.
25.00 GB
4.00 MB
2.00 TB
Create
Cancel

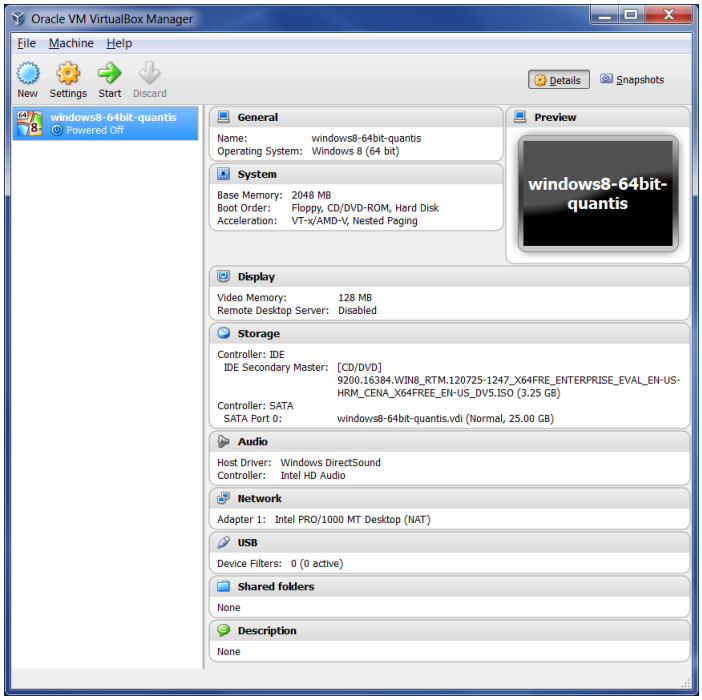
Click *Create* to finalize the wizard.



Now the virtual machine is created. However the CD-Rom drive is not set. For this click the *Settings* icon.



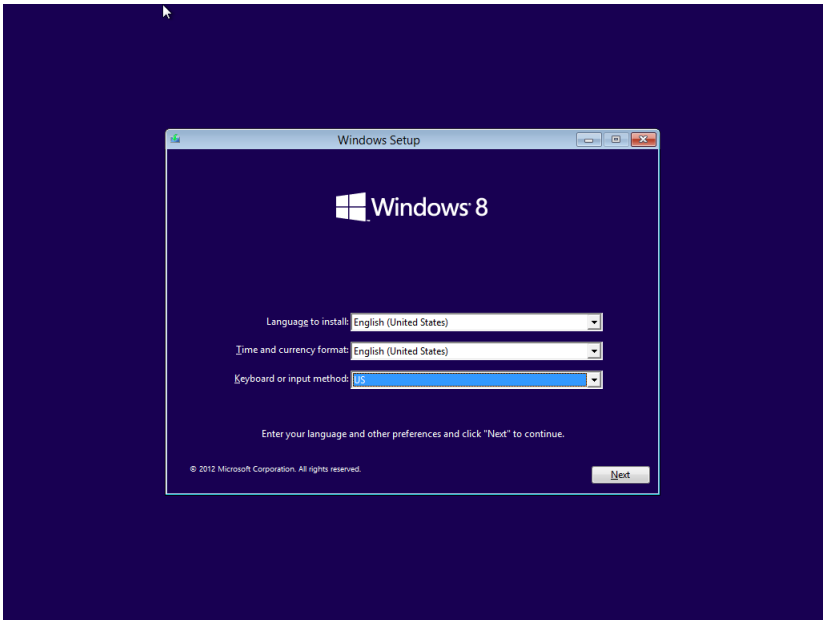
Select *Storage* and click on the disk icon close to the *Empty* label. Then click on the CD icon in the *Attributes* section to add the Windows8 ISO file. Click *OK* to close the settings window.



Now the virtual machine is created and ready to install the guest operating system.

2.2.3. Guest OS installation

Click the *Start* icon to run the Windows installer.

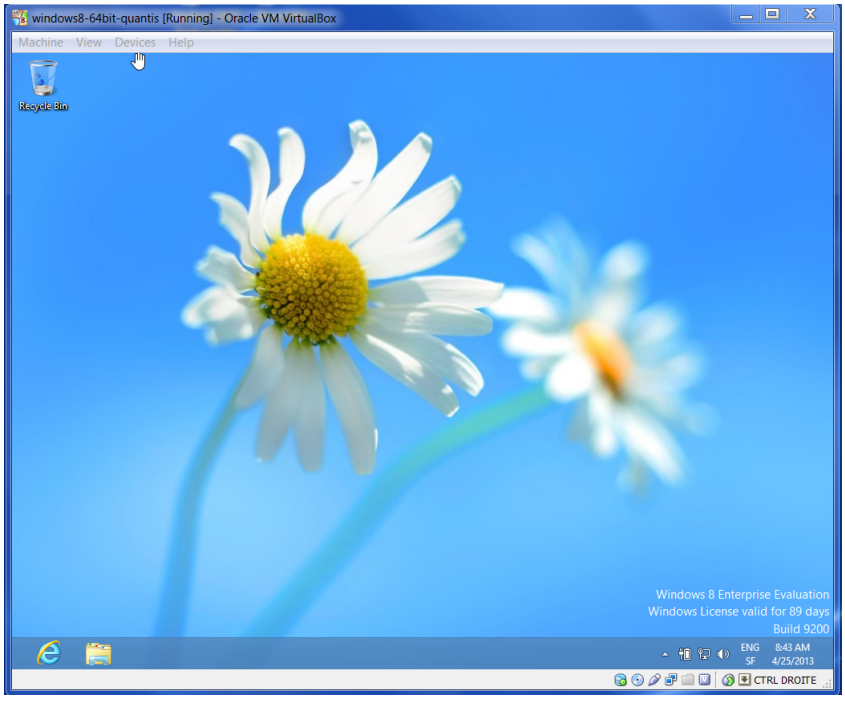

Windows Setup
Windows 8
Language to install: English (United States)
Time and currency format: English (United States)
Keyboard or input method: US
Enter your language and other preferences and click "Next" to continue.
© 2012 Microsoft Corporation. All rights reserved.
Next

Install Windows as you would do for a physical computer.

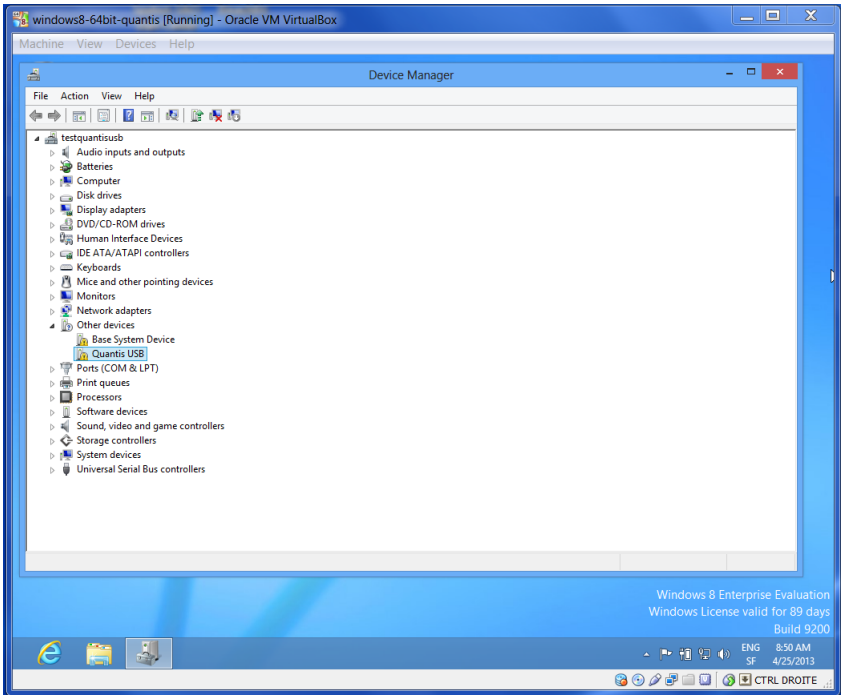
Windows8 is installed.

2.2.4. Connect Quantis-USB

Quantis-USB must be attached to the virtual machine.



Click in the menu *Devices, USB Devices, id Quantique Quantis USB.*



Finally open the *Device Manager* in the *Control Panel*. Quantis-USB must be listed under *Other devices*. From this point the driver may be installed as described in the *Quantis User Manual*.

Chapter 3. Quantis-PCI/PCIe

As stated in the introduction section any PCI/PCIe device requires PCI-passthrough to run. However, PCI-passthrough requires a host which supports memory and I/O virtualization. Those features are located in the CPU and in the chipset. Intel and AMD have different names for it:

- Intel's **VT-d** (Virtualization Technology for Directed I/O)
- AMD's **AMD-Vi** (I/O Virtualization Technology)

Check the manufacturer web site to make sure your CPU/Chipset has this feature.

Finally this feature must be enabled in the BIOS.

The following setup has been used:

- Computer: Dell Inc. Optiplex 9010
- CPU: Intel core i7-3770 @ 3.40GHz
- RAM: 16 GBytes

This section explains how to setup a Quantis-PCI/PCIe under:

- VMware ESXi with vSphere Client

Note

PCI and PCI-express (PCIe) device are are fully identical for the software. So the term PCI apply for both PCI and PCIe devices.

3.1. VMware ESXi

VMware ESXi has PCI-passthough support since version 4.0. VMware calls it *VMDirectPath I/O*.

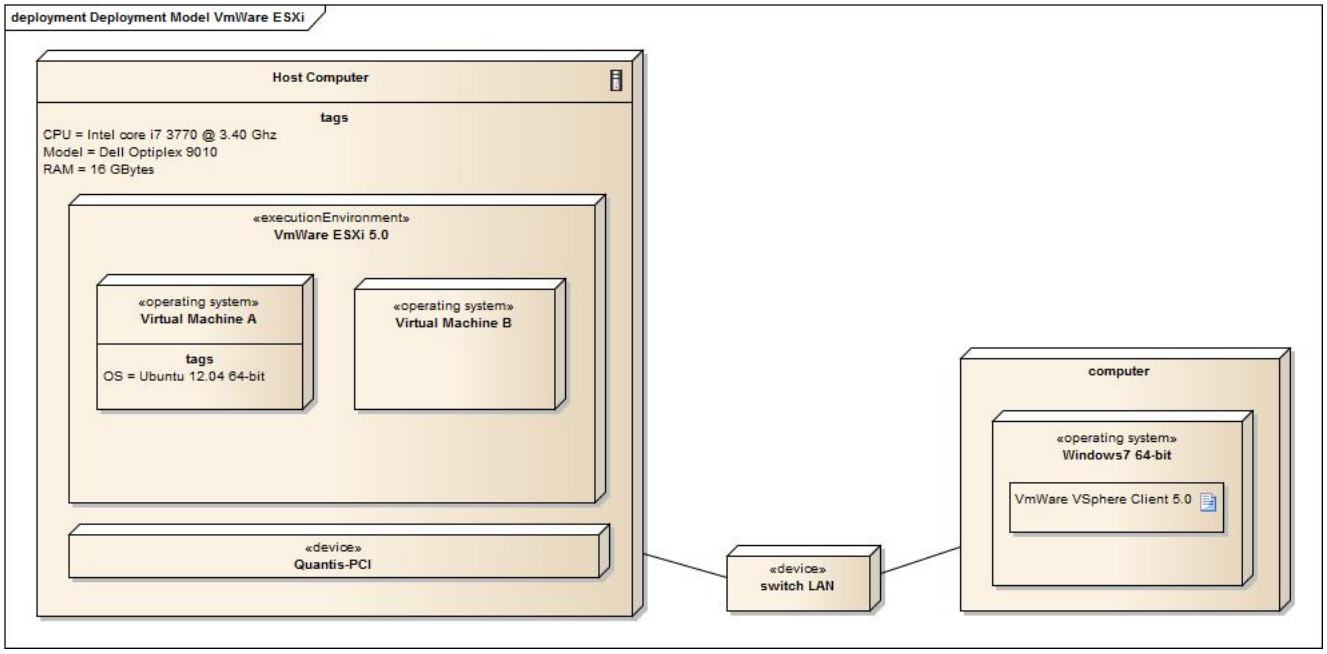
Note

At writing time, VMware ESXi version 5.1 is available. However this version contains a bug related to PCI passthrough. The ESXi510-201212401-BG patch is required. Check the VMware Knowledge Base KB209030 for details.

For convenience, this document is based on the version 5.0. (VMKernel Release Build 469512)

Important

The hardware compatibility of your machine with VMware ESXi must be checked. For details visit: `www.vmware.com/resources/compatibility`



This installation is done in 5 steps:

1. Install the VMWare ESXi 5.0 hypervisor on the host computer
2. Install the VMware vSphere Client 5.0 on a second computer for administration
3. Configure the hypervisor for PCI passthrough
4. Create a virtual machine that runs on the hypervisor
5. Install the guest OS

3.1.1. VMware ESXi Hypervisor installation

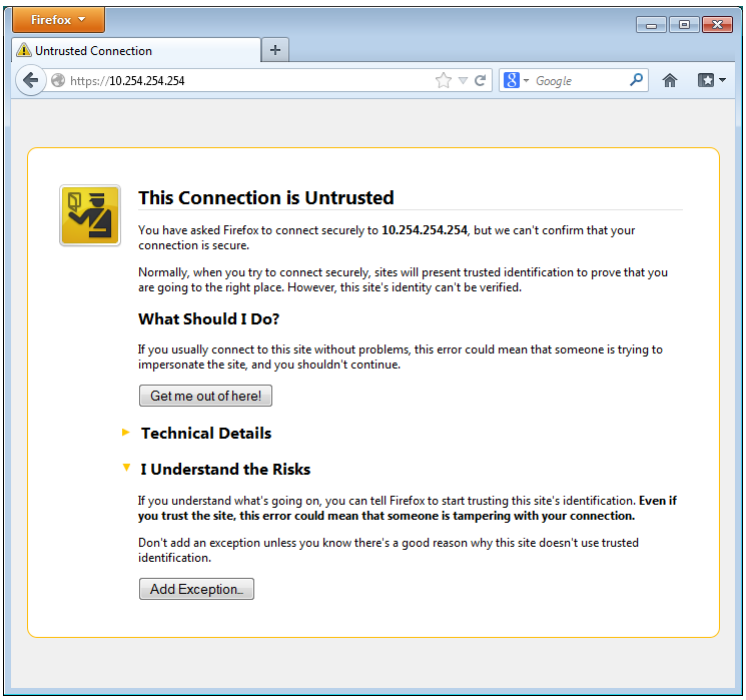
Installation of the hypervisor is quite strait forward:

1. Create an account on the VMware web site to be able to download the VMware ESXi 5.0 evaluation ISO file *VMware-VMvisor-Installer-5.0.0-469512.x86_64.iso*. A 60 days trial edition is available for free.
2. Burn the ISO file to a CD-Rom.
3. Boot the host computer with the CD-Rom.
4. Install VMware ESXi using the default settings (accept license agreement, select the default disk, select keyboard layout, enter a root password and finally confirm the installation).
5. Reboot and retrieve the IP address on the screen of the hypervisor. This IP address is required to manage the hypervisor from vSphere Client.

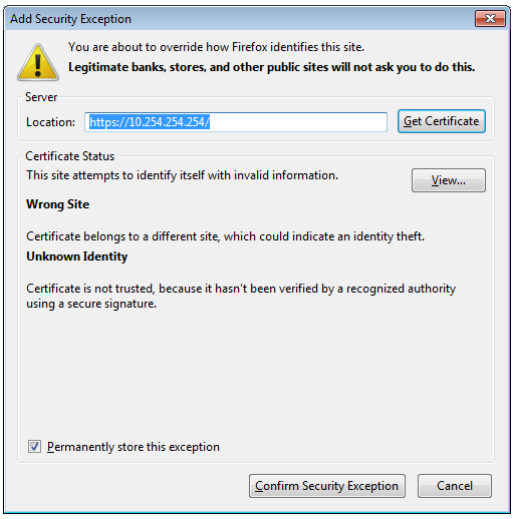
3.1.2. VMware vSphere Client installation

Since vSphere Client is only available for Windows, the management computer must run Windows.

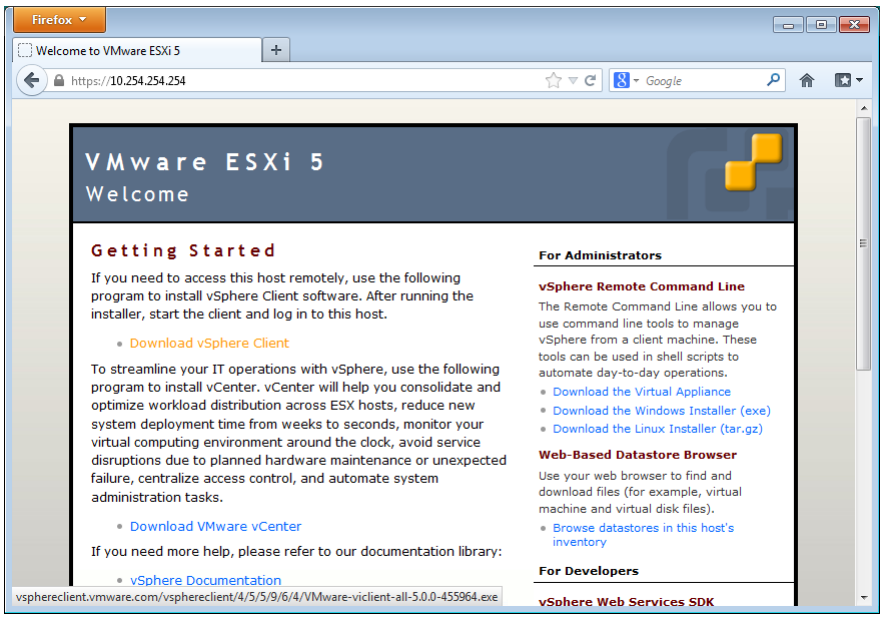
On the management computer install vSphere Client 5.0. For this, open the web console of the hypervisor with your browser (type the IP address previously given by the hypervisor).


Firefox
Untrusted Connection
https://10.254.254.254
Google
This Connection is Untrusted
You have asked Firefox to connect securely to 10.254.254.254, but we can't confirm that your connection is secure.
Normally, when you try to connect securely, sites will present trusted identification to prove that you are going to the right place. However, this site's identity can't be verified.
What Should I Do?
If you usually connect to this site without problems, this error could mean that someone is trying to impersonate the site, and you shouldn't continue.
Get me out of here!
Technical Details
I Understand the Risks
If you understand what's going on, you can tell Firefox to start trusting this site's identification. Even if you trust the site, this error could mean that someone is tampering with your connection.
Don't add an exception unless you know there's a good reason why this site doesn't use trusted identification.
Add Exception...

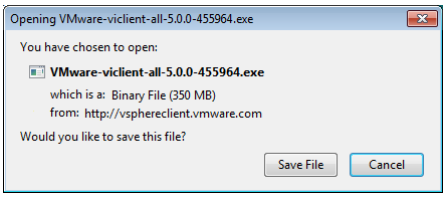
The browser (Firefox in this case) may warn you about an untrusted connection. In this case add an exception.


Add Security Exception
You are about to override how Firefox identifies this site.
Legitimate banks, stores, and other public sites will not ask you to do this.
Server
Location: https://10.254.254.254/
Get Certificate
Certificate Status
This site attempts to identify itself with invalid information.
View...
Wrong Site
Certificate belongs to a different site, which could indicate an identity theft.
Unknown Identity
Certificate is not trusted, because it hasn't been verified by a recognized authority using a secure signature.
Permanently store this exception
Confirm Security Exception
Cancel

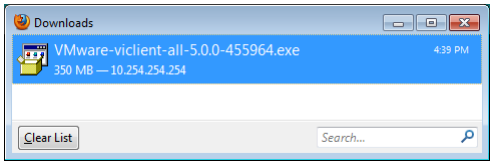
Then confirm the exception by clicking *Confirm Security Exception*.


Firefox
Welcome to VMware ESXi 5
https://10.254.254.254
VMware ESXi 5
Welcome
Getting Started
If you need to access this host remotely, use the following program to install vSphere Client software. After running the installer, start the client and log in to this host.
Download vSphere Client
To streamline your IT operations with vSphere, use the following program to install vCenter. vCenter will help you consolidate and optimize workload distribution across ESX hosts, reduce new system deployment time from weeks to seconds, monitor your virtual computing environment around the clock, avoid service disruptions due to planned hardware maintenance or unexpected failure, centralize access control, and automate system administration tasks.
Download VMware vCenter
If you need more help, please refer to our documentation library:
vSphere Documentation
For Administrators
vSphere Remote Command Line
The Remote Command Line allows you to use command line tools to manage vSphere from a client machine. These tools can be used in shell scripts to automate day-to-day operations.
Download the Virtual Appliance
Download the Windows Installer (exe)
Download the Linux Installer (tar.gz)
Web-Based Datastore Browser
Use your web browser to find and download files (for example, virtual machine and virtual disk files).
Browse datastores in this host's inventory
For Developers
vSphere Web Services SDK
vsphereclient.vmware.com/vsphereclient/4/5/5/9/6/4/VMware-viclient-all-5.0.0-455964.exe

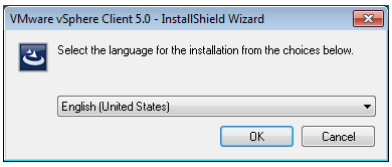
Then the ESXi hypervisor homepage proposes a link to *Download the vSphere Client*.



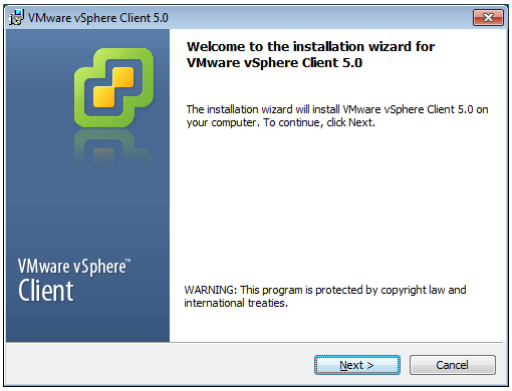
Save the file



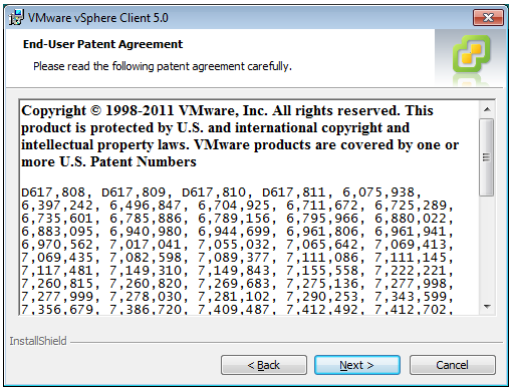
When the download has finished, right-click to open it.

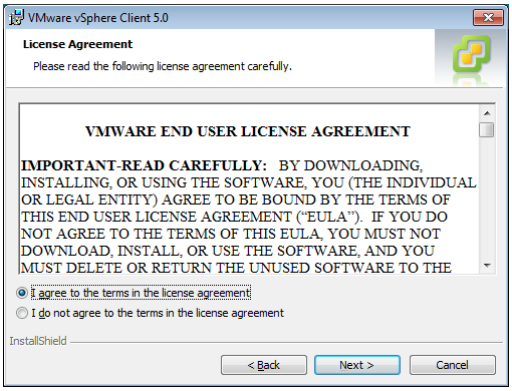

VMware vSphere Client 5.0 - InstallShield Wizard
Select the language for the installation from the choices below.
English (United States)
OK
Cancel

The first window of the installation offers the possibility to choose the installation language. Click *OK*.

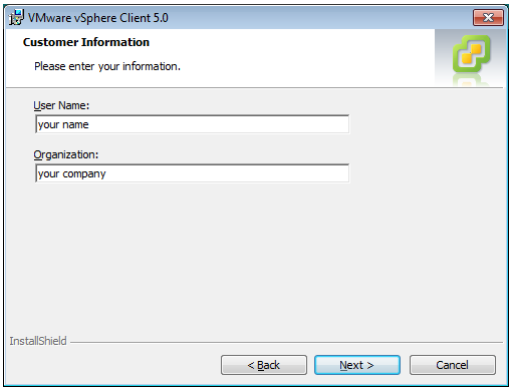

VMware vSphere Client 5.0
Welcome to the installation wizard for VMware vSphere Client 5.0
The installation wizard will install VMware vSphere Client 5.0 on your computer. To continue, click Next.
VMware vSphere
Client
WARNING: This program is protected by copyright law and international treaties.
Next >
Cancel

After a few seconds the welcome window appears. Click *Next*.

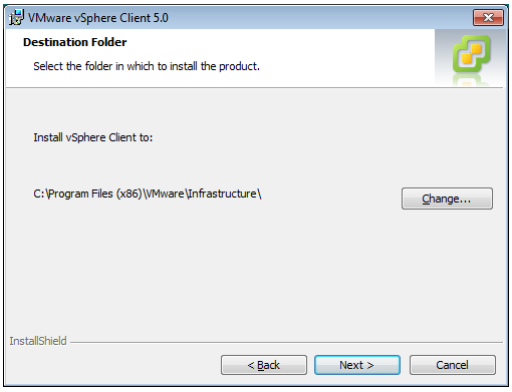



VMware vSphere Client 5.0
License Agreement
Please read the following license agreement carefully.
VMWARE END USER LICENSE AGREEMENT
IMPORTANT-READ CAREFULLY: BY DOWNLOADING, INSTALLING, OR USING THE SOFTWARE, YOU (THE INDIVIDUAL OR LEGAL ENTITY) AGREE TO BE BOUND BY THE TERMS OF THIS END USER LICENSE AGREEMENT ("EULA"). IF YOU DO NOT AGREE TO THE TERMS OF THIS EULA, YOU MUST NOT DOWNLOAD, INSTALL, OR USE THE SOFTWARE, AND YOU MUST DELETE OR RETURN THE UNUSED SOFTWARE TO THE
I agree to the terms in the license agreement
I do not agree to the terms in the license agreement
InstallShield
< Back
Next >
Cancel

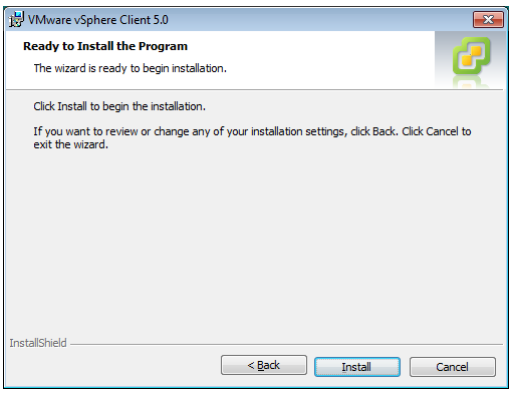
Click *Next* to accept the patent and license agreements.



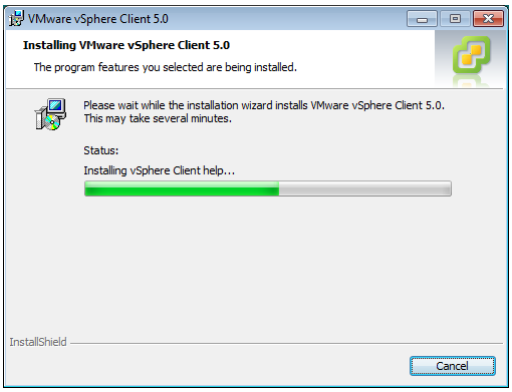
Enter your user name and your company name. Then click *Next*.



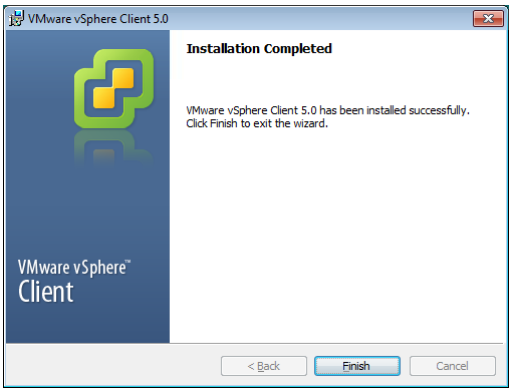
If the default destination folder is okay for you, click *Next.*


VMware vSphere Client 5.0
Ready to Install the Program
The wizard is ready to begin installation.
Click Install to begin the installation.
If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.
InstallShield
< Back
Install
Cancel

Now everything is defined. Click *Next* to start the installation.


VMware vSphere Client 5.0
Installing VMware vSphere Client 5.0
The program features you selected are being installed.
Please wait while the installation wizard installs VMware vSphere Client 5.0. This may take several minutes.
Status:
Installing vSphere Client help...
InstallShield
Cancel

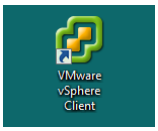
Wait a few moments...



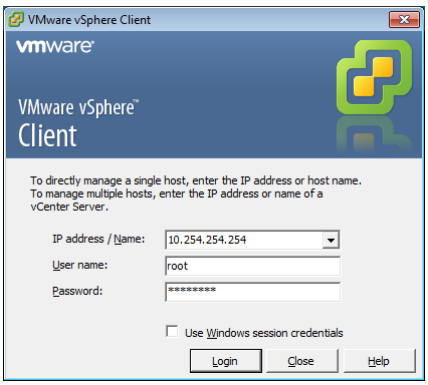
When the installation complete, Click *Finish*.

3.1.3. Configure the hypervisor

Prior to installing a virtual machine, the hypervisor must be configured through vSphere Client to enable the PCI passthrough.



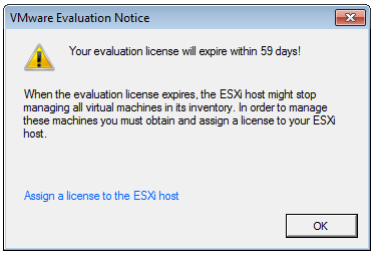
Run VMware vSphere Client



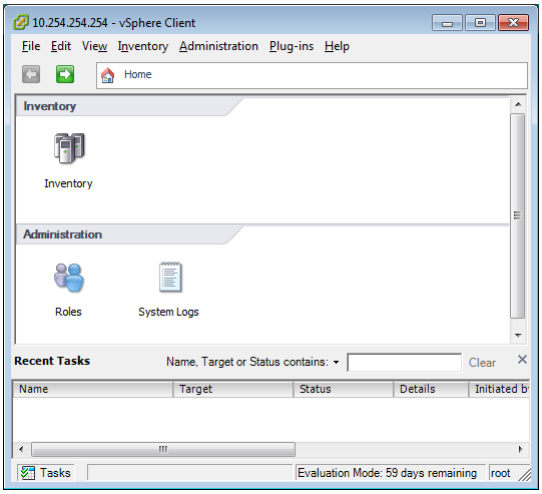
Connect to the hypervisor with the given IP address, the *root* user name and *root* password defined during the hypervisor installation.

Security Warning
Certificate Warnings
An untrusted SSL certificate is installed on "10.254.254.254" and secure communication cannot be guaranteed. Depending on your security policy, this issue might not represent a security concern. You may need to install a trusted SSL certificate on your server to prevent this warning from appearing.
The certificate received from "10.254.254.254" was issued for "localhost.idquantique.local.". Secure communication with "10.254.254.254" cannot be guaranteed. Ensure that the fully-qualified domain name on the certificate matches the address of the server you are trying to connect to.
Click Ignore to continue using the current SSL certificate.
View Certificate
Ignore
Cancel
Install this certificate and do not display any security warnings for "10.254.254.254".

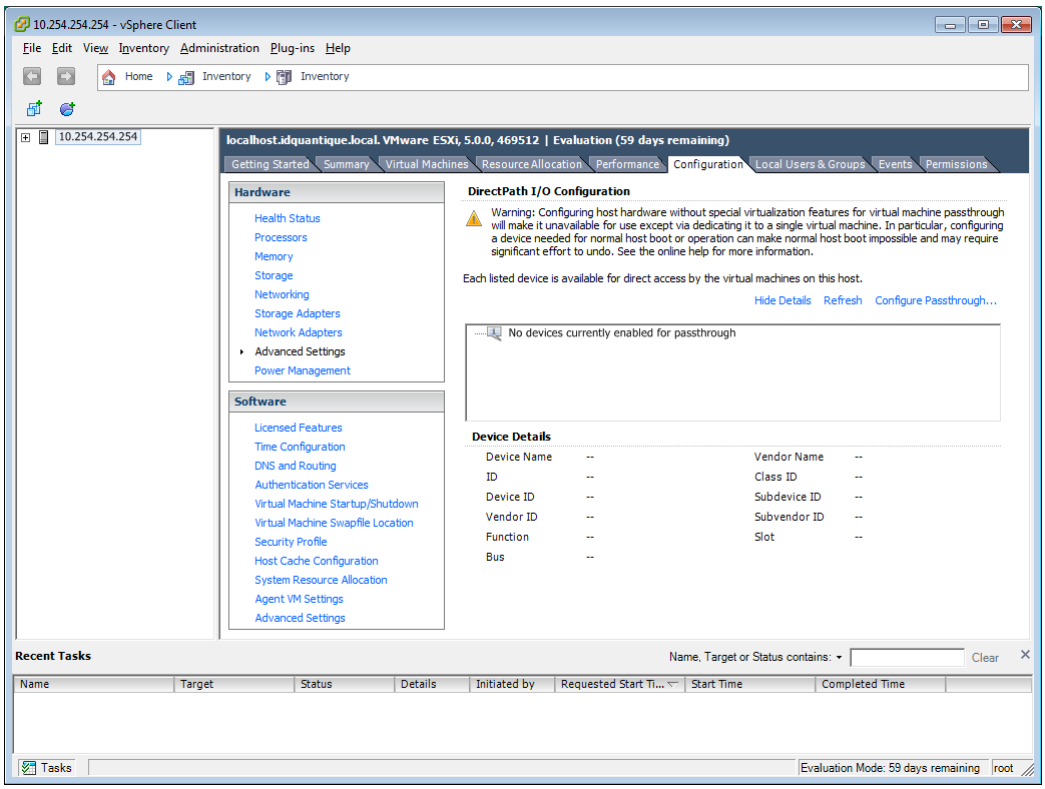
A Security warning explains the SSL certificate is untrusted. Click *Ignore*.


VMware Evaluation Notice
Your evaluation license will expire within 59 days!
When the evaluation license expires, the ESXi host might stop managing all virtual machines in its inventory. In order to manage these machines you must obtain and assign a license to your ESXi host.
Assign a license to the ESXi host
OK

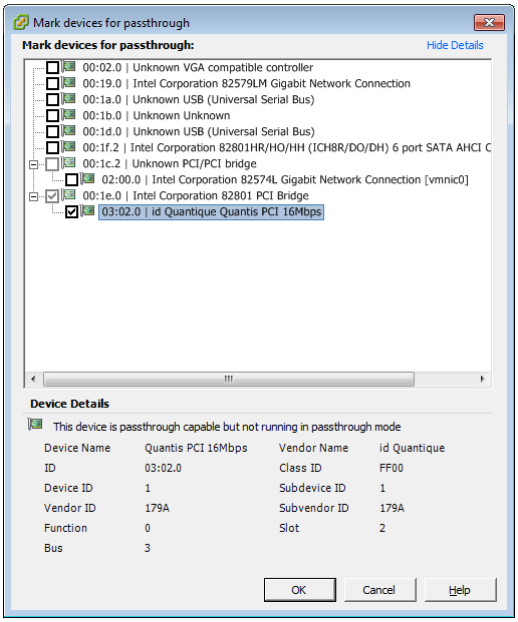
Click *OK* to pass the Evaluation remainder.



Select the hypervisor. For this click on the *Inventory*.


10.254.254.254 - vSphere Client
File Edit View Inventory Administration Plug-ins Help
Home Inventory Inventory
10.254.254.254
localhost.idquantique.local. VMware ESXi, 5.0.0, 469512 | Evaluation (59 days remaining)
Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Local Users & Groups Events Permissions
Hardware
Health Status
Processors
Memory
Storage
Networking
Storage Adapters
Network Adapters
Advanced Settings
Power Management
Software
Licensed Features
Time Configuration
DNS and Routing
Authentication Services
Virtual Machine Startup/Shutdown
Virtual Machine Swapfile Location
Security Profile
Host Cache Configuration
System Resource Allocation
Agent VM Settings
Advanced Settings
DirectPath I/O Configuration
Warning: Configuring host hardware without special virtualization features for virtual machine passthrough will make it unavailable for use except via dedicating it to a single virtual machine. In particular, configuring a device needed for normal host boot or operation can make normal host boot impossible and may require significant effort to undo. See the online help for more information.
Each listed device is available for direct access by the virtual machines on this host.
Hide Details Refresh Configure Passthrough...
No devices currently enabled for passthrough
Device Details
Device Name -- Vendor Name --
ID -- Class ID --
Device ID -- Subdevice ID --
Vendor ID -- Subvendor ID --
Function -- Slot --
Bus --
Recent Tasks
Name, Target or Status contains: Clear
Name Target Status Details Initiated by Requested Start Ti... Start Time Completed Time
Tasks
Evaluation Mode: 59 days remaining
root

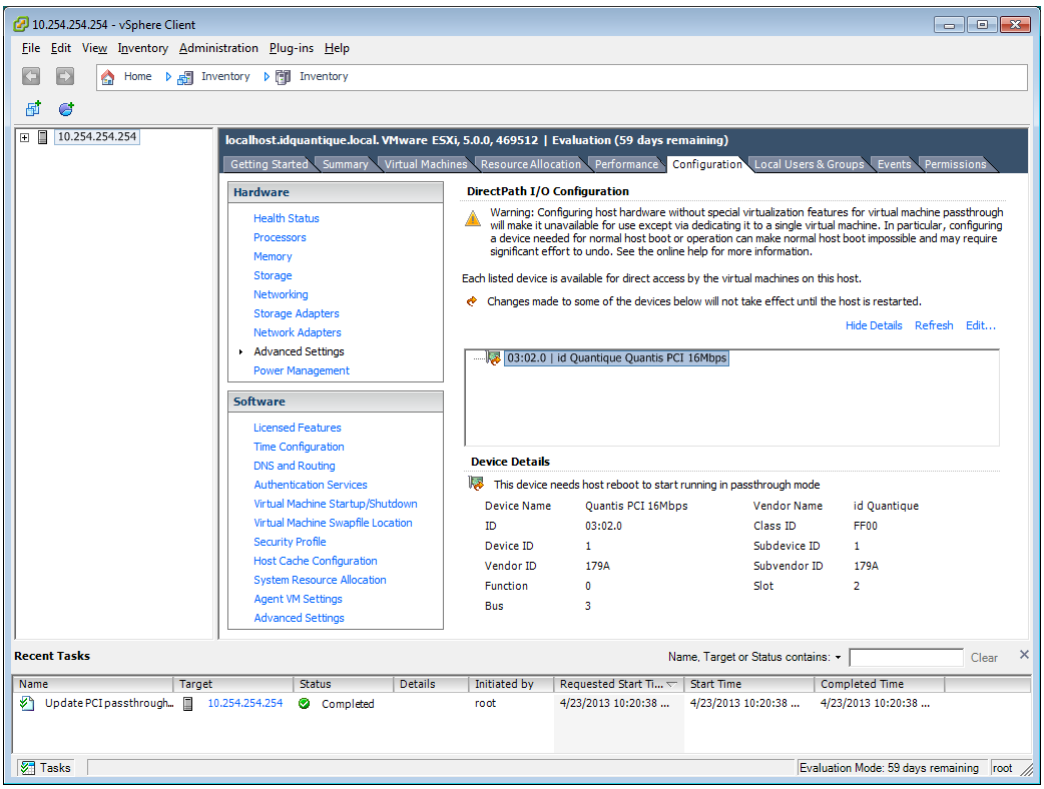
Select the *Configuration* tab, and in Hardware section click *Advanced Settings*. To add the Quantis-PCI passthrough click on *Configure Passthrough...*


Mark devices for passthrough
Mark devices for passthrough:
Hide Details
00:02.0 | Unknown VGA compatible controller
00:19.0 | Intel Corporation 82579LM Gigabit Network Connection
00:1a.0 | Unknown USB (Universal Serial Bus)
00:1b.0 | Unknown Unknown
00:1d.0 | Unknown USB (Universal Serial Bus)
00:1f.2 | Intel Corporation 82801HR/HO/HH (ICH8R/DO/DH) 6 port SATA AHCI C
00:1c.2 | Unknown PCI/PCI bridge
02:00.0 | Intel Corporation 82574L Gigabit Network Connection [vmnic0]
00:1e.0 | Intel Corporation 82801 PCI Bridge
03:02.0 | id Quantique Quantis PCI 16Mbps
Device Details
This device is passthrough capable but not running in passthrough mode
Device Name Quantis PCI 16Mbps Vendor Name id Quantique
ID 03:02.0 Class ID FF00
Device ID 1 Subdevice ID 1
Vendor ID 179A Subvendor ID 179A
Function 0 Slot 2
Bus 3
OK Cancel Help

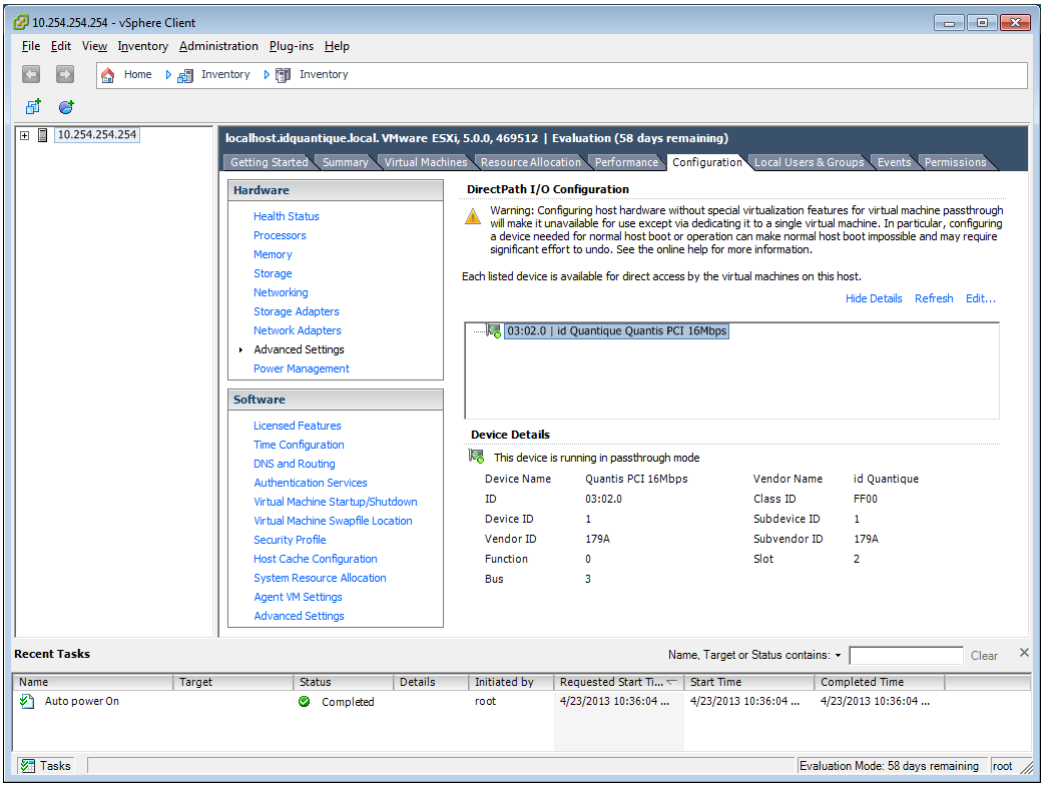
Mark the *id Quantique Quantis PCI* board check box. Then click *OK* to close this window.

Note

The device is always identified as Quantis PCI 16 Mbps even for a 4 Mbps version.


10.254.254.254 - vSphere Client
File Edit View Inventory Administration Plug-ins Help
Home Inventory Inventory
10.254.254.254
localhost.idquantique.local. VMware ESXi, 5.0.0, 469512 | Evaluation (59 days remaining)
Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Local Users & Groups Events Permissions
Hardware
Health Status
Processors
Memory
Storage
Networking
Storage Adapters
Network Adapters
Advanced Settings
Power Management
Software
Licensed Features
Time Configuration
DNS and Routing
Authentication Services
Virtual Machine Startup/Shutdown
Virtual Machine Swapfile Location
Security Profile
Host Cache Configuration
System Resource Allocation
Agent VM Settings
Advanced Settings
DirectPath I/O Configuration
Warning: Configuring host hardware without special virtualization features for virtual machine passthrough will make it unavailable for use except via dedicating it to a single virtual machine. In particular, configuring a device needed for normal host boot or operation can make normal host boot impossible and may require significant effort to undo. See the online help for more information.
Each listed device is available for direct access by the virtual machines on this host.
Changes made to some of the devices below will not take effect until the host is restarted.
Hide Details Refresh Edit...
03:02.0 | id Quantique Quantis PCI 16Mbps
Device Details
This device needs host reboot to start running in passthrough mode
Device Name Quantis PCI 16Mbps Vendor Name id Quantique
ID 03:02.0 Class ID FF00
Device ID 1 Subdevice ID 1
Vendor ID 179A Subvendor ID 179A
Function 0 Slot 2
Bus 3
Recent Tasks
Name, Target or Status contains: Clear
Name Target Status Details Initiated by Requested Start Ti... Start Time Completed Time
Update PCI passthrough... 10.254.254.254 Completed root 4/23/2013 10:20:38 ... 4/23/2013 10:20:38 ... 4/23/2013 10:20:38 ...
Tasks
Evaluation Mode: 59 days remaining root

A reboot of the hypervisor is required for the changes to take effect. To reboot click menu *Inventory*, *Host*, *Reboot*.

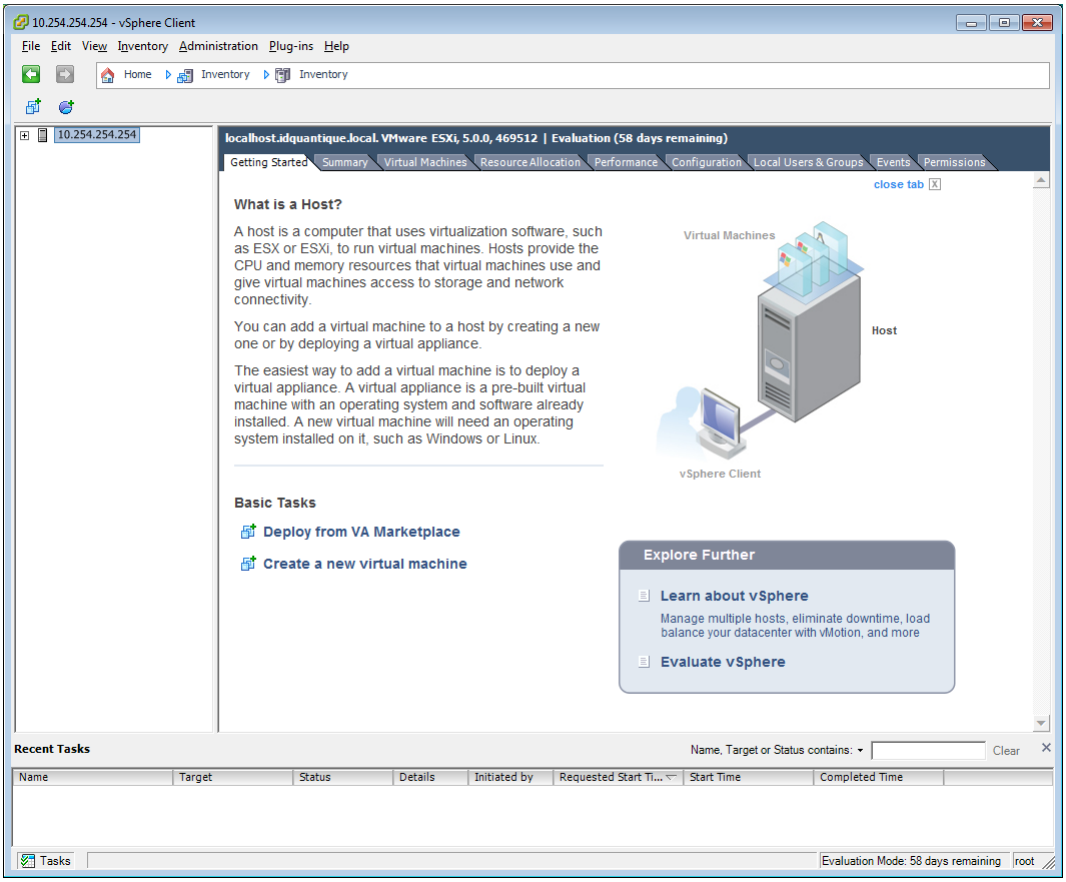

10.254.254.254 - vSphere Client
File Edit View Inventory Administration Plug-ins Help
Home Inventory Inventory
10.254.254.254
localhost.idquantique.local. VMware ESXi, 5.0.0, 469512 | Evaluation (58 days remaining)
Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Local Users & Groups Events Permissions
Hardware
Health Status
Processors
Memory
Storage
Networking
Storage Adapters
Network Adapters
Advanced Settings
Power Management
Software
Licensed Features
Time Configuration
DNS and Routing
Authentication Services
Virtual Machine Startup/Shutdown
Virtual Machine Swapfile Location
Security Profile
Host Cache Configuration
System Resource Allocation
Agent VM Settings
Advanced Settings
DirectPath I/O Configuration
Warning: Configuring host hardware without special virtualization features for virtual machine passthrough will make it unavailable for use except via dedicating it to a single virtual machine. In particular, configuring a device needed for normal host boot or operation can make normal host boot impossible and may require significant effort to undo. See the online help for more information.
Each listed device is available for direct access by the virtual machines on this host.
Hide Details Refresh Edit...
03:02.0 | id Quantique Quantis PCI 16Mbps
Device Details
This device is running in passthrough mode
Device Name Quantis PCI 16Mbps Vendor Name id Quantique
ID 03:02.0 Class ID FF00
Device ID 1 Subdevice ID 1
Vendor ID 179A Subvendor ID 179A
Function 0 Slot 2
Bus 3
Recent Tasks
Name, Target or Status contains: Clear
Name Target Status Details Initiated by Requested Start Ti... Start Time Completed Time
Auto power On Completed root 4/23/2013 10:36:04 ... 4/23/2013 10:36:04 ... 4/23/2013 10:36:04 ...
Tasks
Evaluation Mode: 58 days remaining root

Finally return in the *Configuration*, *Advanced Settings* to make sure the Quantis PCI icon becomes green meaning the device is running in passthrough mode.

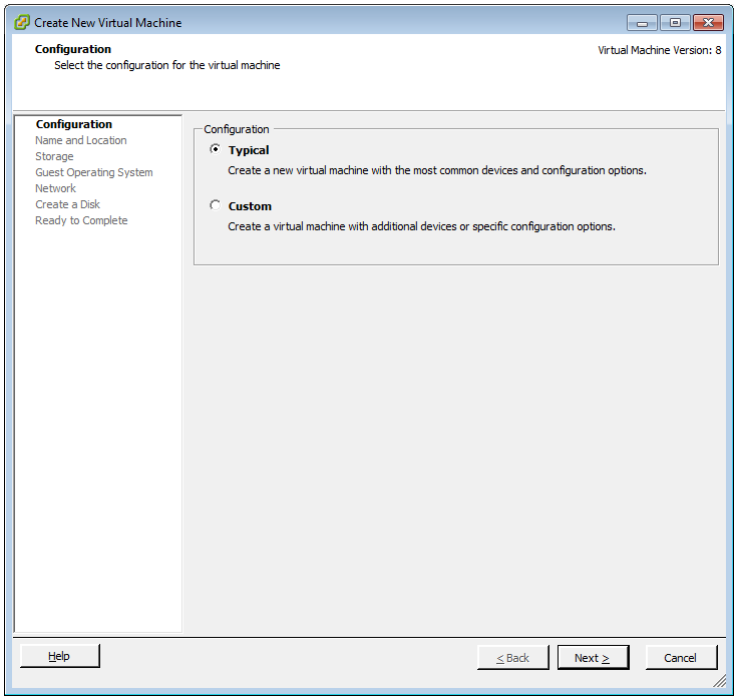
Now the hypervisor is configured with the Quantis PCI in passthrough mode.

3.1.4. Create the virtual machine

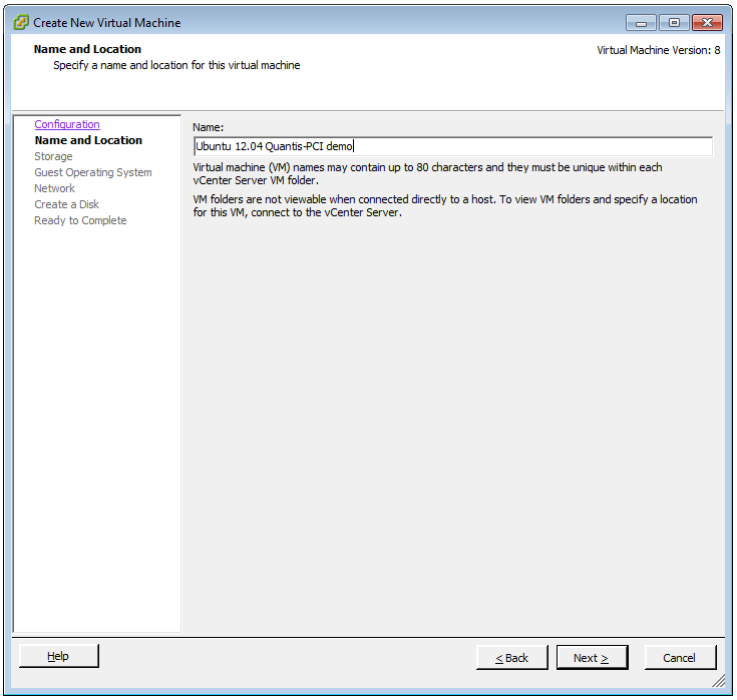
In this example a Ubuntu 12.04 virtual machine will be created. It assumes you previously downloaded an ISO installation image of Ubuntu 12.04 and burned it to a CD-Rom.


10.254.254.254 - vSphere Client
File Edit View Inventory Administration Plug-ins Help
Home Inventory Inventory
10.254.254.254
localhost.idquantique.local. VMware ESXi, 5.0.0, 469512 | Evaluation (58 days remaining)
Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Local Users & Groups Events Permissions
close tab
What is a Host?
A host is a computer that uses virtualization software, such as ESX or ESXi, to run virtual machines. Hosts provide the CPU and memory resources that virtual machines use and give virtual machines access to storage and network connectivity.
You can add a virtual machine to a host by creating a new one or by deploying a virtual appliance.
The easiest way to add a virtual machine is to deploy a virtual appliance. A virtual appliance is a pre-built virtual machine with an operating system and software already installed. A new virtual machine will need an operating system installed on it, such as Windows or Linux.
Virtual Machines
Host
vSphere Client
Basic Tasks
Deploy from VA Marketplace
Create a new virtual machine
Explore Further
Learn about vSphere
Manage multiple hosts, eliminate downtime, load balance your datacenter with vMotion, and more
Evaluate vSphere
Recent Tasks
Name, Target or Status contains:
Clear
Name Target Status Details Initiated by Requested Start Ti... Start Time Completed Time
Tasks
Evaluation Mode: 58 days remaining
root

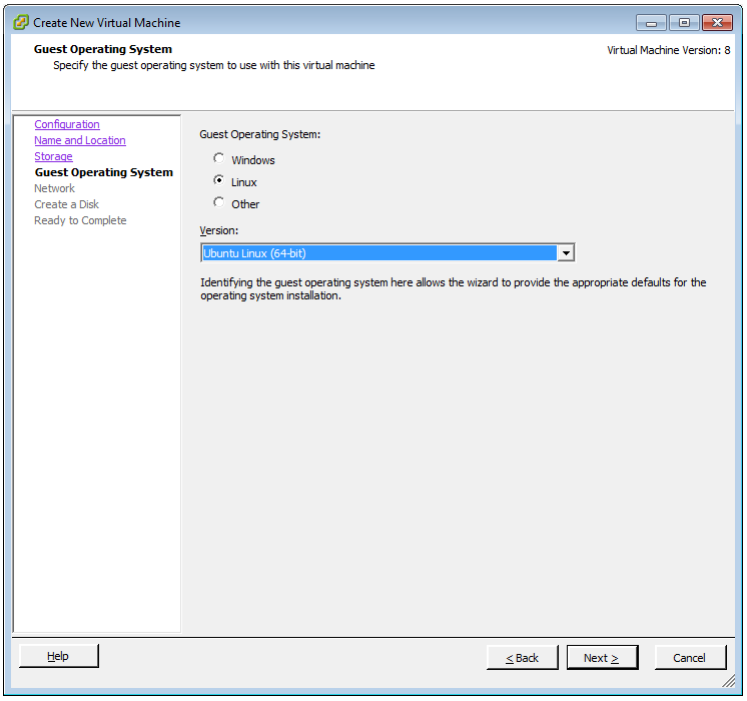
In the *Getting Started* tab click *Create a new virtual machine*.



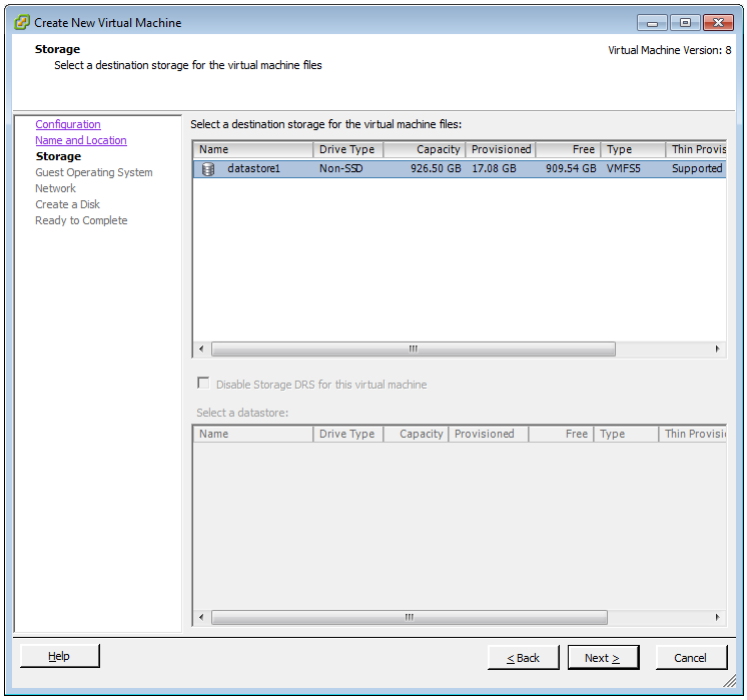
Select the *Typical* configuration and click *Next*.

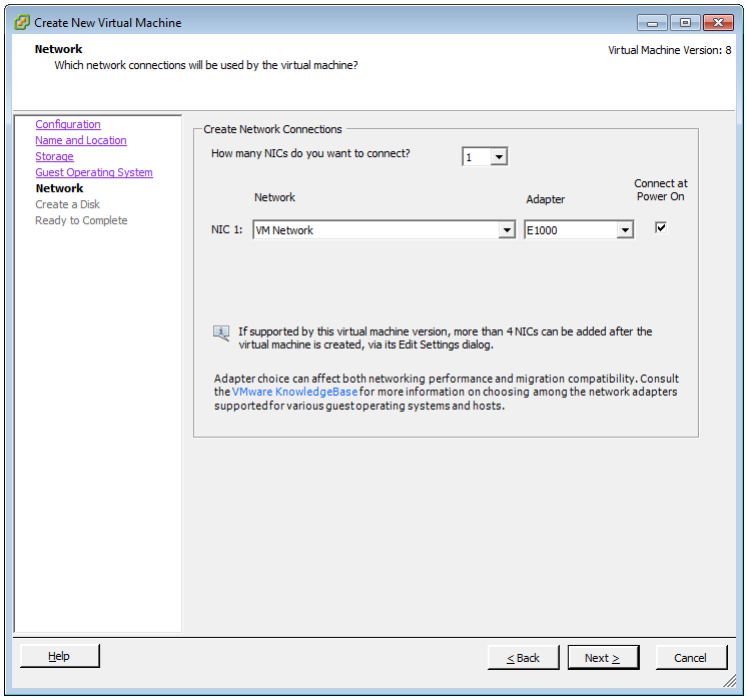

Create New Virtual Machine
Name and Location
Specify a name and location for this virtual machine
Virtual Machine Version: 8
Configuration
Name and Location
Storage
Guest Operating System
Network
Create a Disk
Ready to Complete
Name:
Ubuntu 12.04 Quantis-PCI demo
Virtual machine (VM) names may contain up to 80 characters and they must be unique within each vCenter Server VM folder.
VM folders are not viewable when connected directly to a host. To view VM folders and specify a location for this VM, connect to the vCenter Server.
Help
< Back
Next >
Cancel

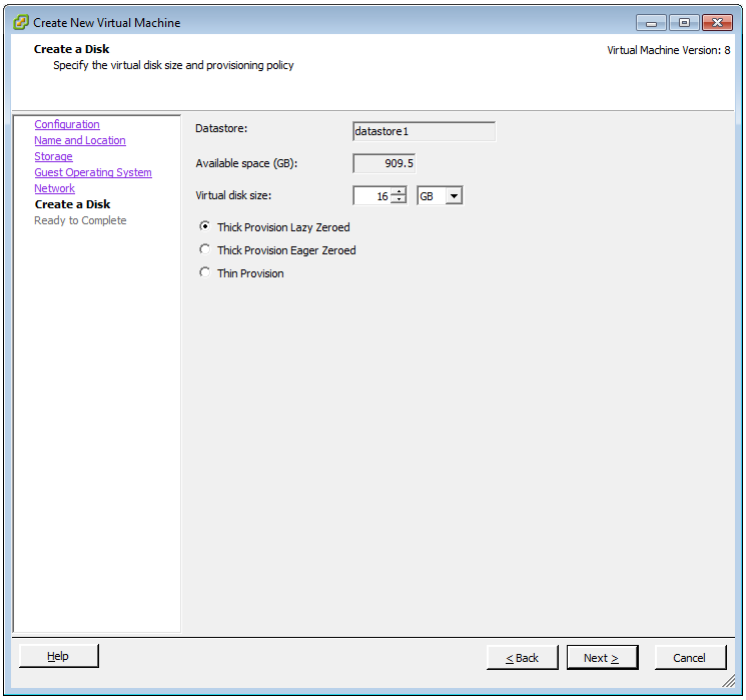
Enter a name for this virtual machine. Then click *Next*.

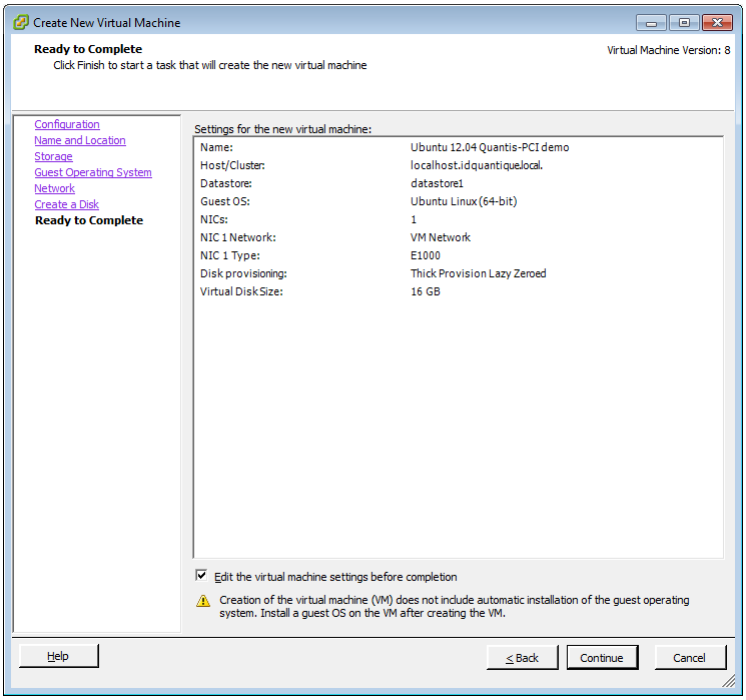


Select *Linux* and *Ubuntu Linux (64-bit)*. Click *Next*.

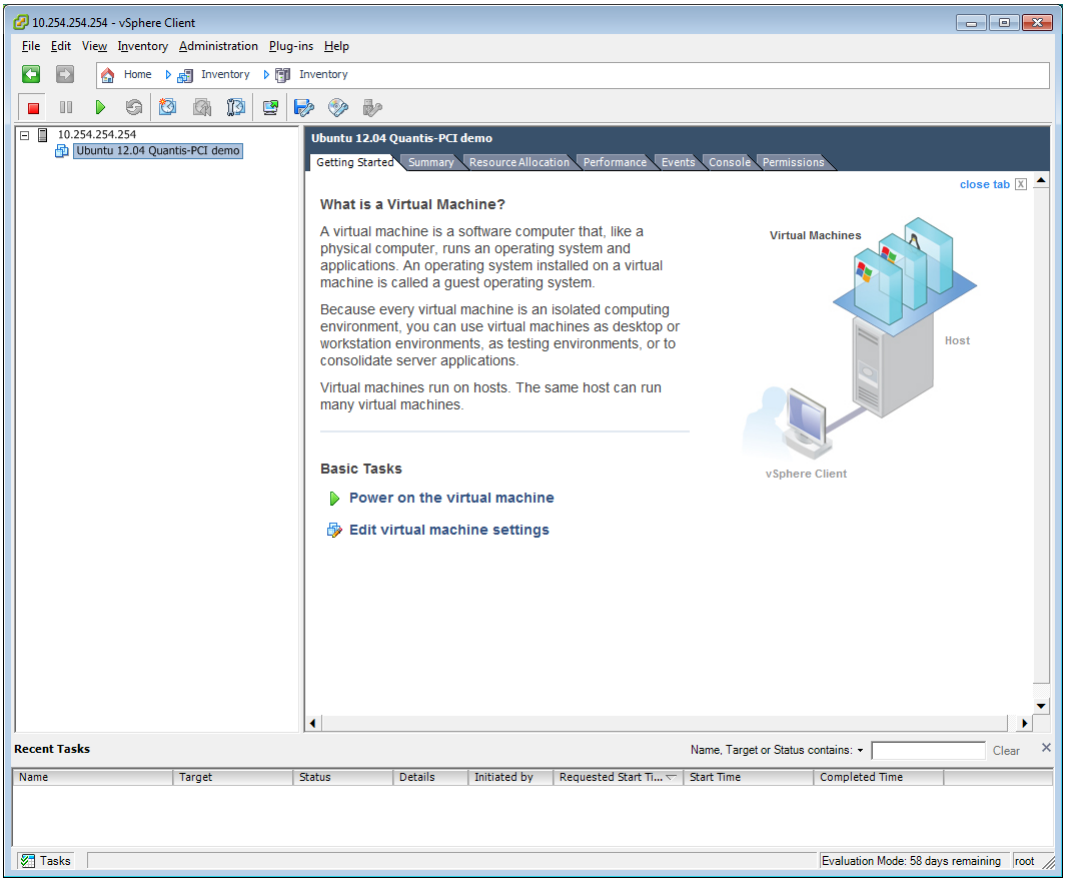

Create New Virtual Machine
Storage
Select a destination storage for the virtual machine files
Virtual Machine Version: 8
Configuration
Name and Location
Storage
Guest Operating System
Network
Create a Disk
Ready to Complete
Select a destination storage for the virtual machine files:
Name
Drive Type
Capacity
Provisioned
Free
Type
Thin Provis
datastore1
Non-SSD
926.50 GB
17.08 GB
909.54 GB
VMFS5
Supported
Disable Storage DRS for this virtual machine
Select a datastore:
Name
Drive Type
Capacity
Provisioned
Free
Type
Thin Provisi
Help
< Back
Next >
Cancel


Create New Virtual Machine
Network
Which network connections will be used by the virtual machine?
Virtual Machine Version: 8
Configuration
Name and Location
Storage
Guest Operating System
Network
Create a Disk
Ready to Complete
Create Network Connections
How many NICs do you want to connect?
1
Network
Adapter
Connect at Power On
NIC 1:
VM Network
E1000
If supported by this virtual machine version, more than 4 NICs can be added after the virtual machine is created, via its Edit Settings dialog.
Adapter choice can affect both networking performance and migration compatibility. Consult the VMware KnowledgeBase for more information on choosing among the network adapters supported for various guest operating systems and hosts.
Help
< Back
Next >
Cancel




Create New Virtual Machine
Ready to Complete
Click Finish to start a task that will create the new virtual machine
Virtual Machine Version: 8
Configuration
Name and Location
Storage
Guest Operating System
Network
Create a Disk
Ready to Complete
Settings for the new virtual machine:
Name: Ubuntu 12.04 Quantis-PCI demo
Host/Cluster: localhost.idquantique.local.
Datastore: datastore1
Guest OS: Ubuntu Linux (64-bit)
NICs: 1
NIC 1 Network: VM Network
NIC 1 Type: E1000
Disk provisioning: Thick Provision Lazy Zeroed
Virtual Disk Size: 16 GB
Edit the virtual machine settings before completion
Creation of the virtual machine (VM) does not include automatic installation of the guest operating system. Install a guest OS on the VM after creating the VM.
Help
< Back
Continue
Cancel

Click *Next* to validate the default settings of *Storage*, *Network*, *Disk*. Finally Click *Continue*.


10.254.254.254 - vSphere Client
File Edit View Inventory Administration Plug-ins Help
Home Inventory Inventory
10.254.254.254
Ubuntu 12.04 Quantis-PCI demo
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Getting Started Summary Resource Allocation Performance Events Console Permissions
close tab
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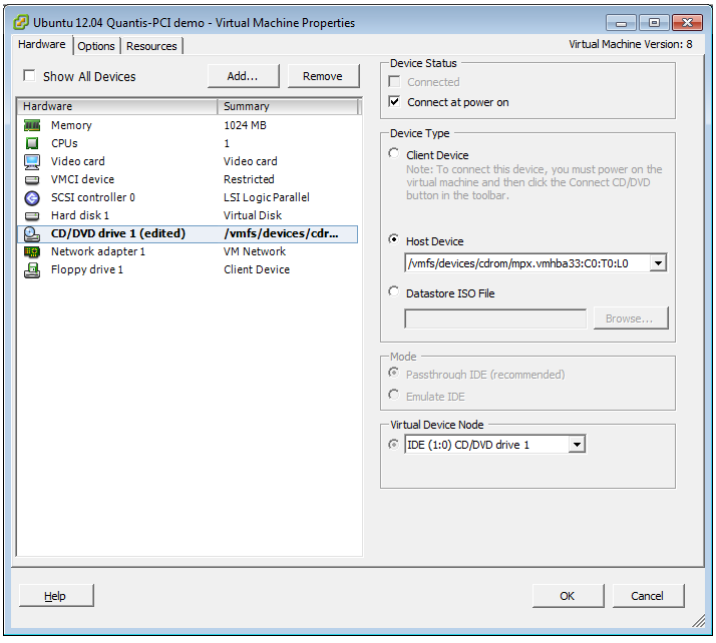
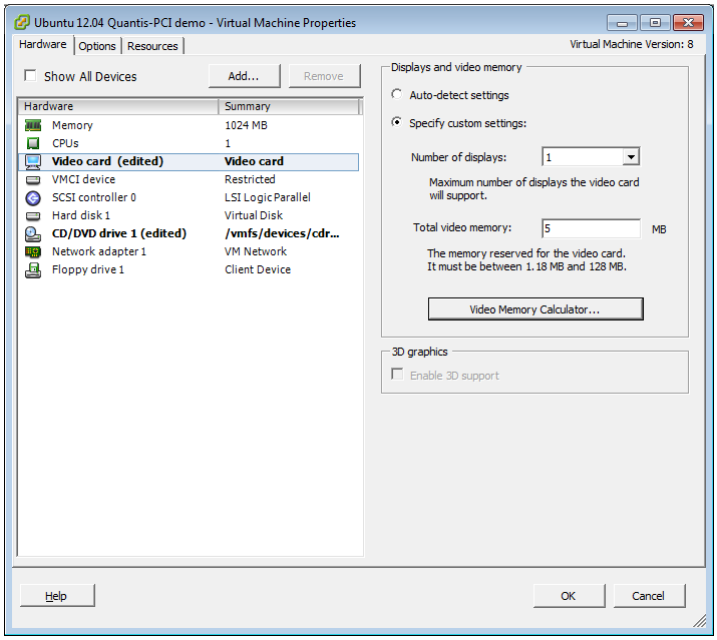
Virtual Machines
Host
vSphere Client
Basic Tasks
Power on the virtual machine
Edit virtual machine settings
Recent Tasks
Name, Target or Status contains:
Clear
Name Target Status Details Initiated by Requested Start Ti... Start Time Completed Time
Tasks
Evaluation Mode: 58 days remaining
root

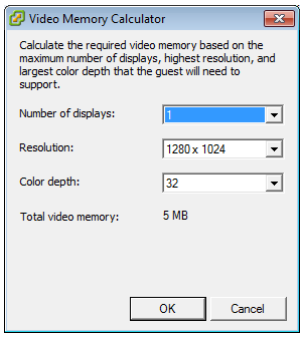
Back in the inventory click *Edit virtual machine settings*.



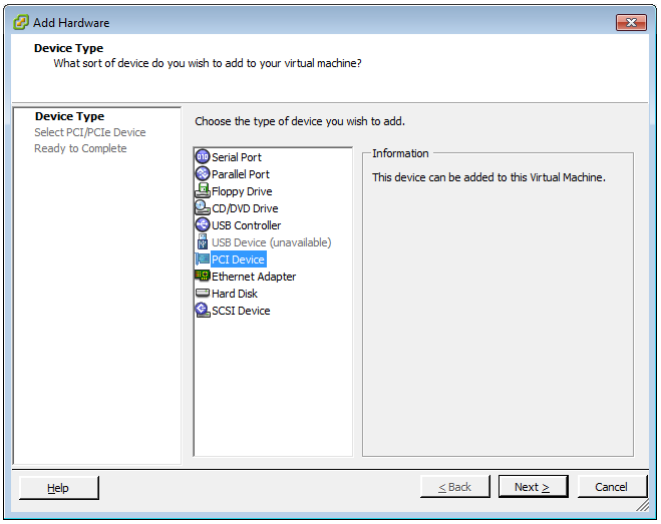
In the hardware tab select *CD/DVD drive*. Then select *Host Device* and enable *Connect at power on*.



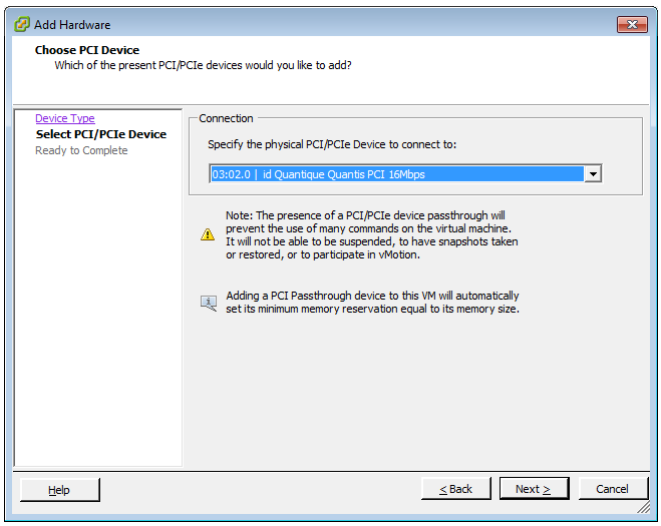
Then select "Video card" and add some extra video memory. The Ubuntu installer requires at least an 800x600 video resolution.



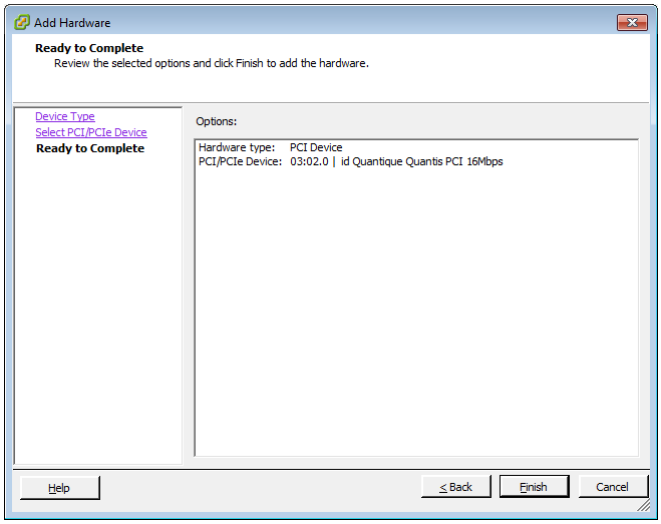
You can use the *Video Memory Calculator* to help you.



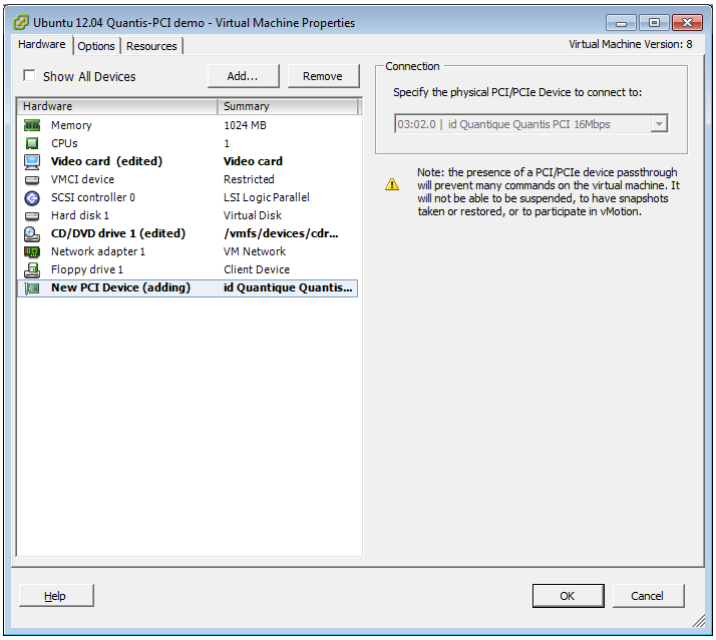
Finally to enable the Quantis-PCI device click the *Add...* button. Then select *PCI Device* and click *Next*.


Add Hardware
Choose PCI Device
Which of the present PCI/PCIe devices would you like to add?
Device Type
Select PCI/PCIe Device
Ready to Complete
Connection
Specify the physical PCI/PCIe Device to connect to:
03:02.0 | id Quantique Quantis PCI 16Mbps
Note: The presence of a PCI/PCIe device passthrough will prevent the use of many commands on the virtual machine. It will not be able to be suspended, to have snapshots taken or restored, or to participate in vMotion.
Adding a PCI Passthrough device to this VM will automatically set its minimum memory reservation equal to its memory size.
Help
< Back
Next >
Cancel

Select the *Quantis PCI* and click *Next*.



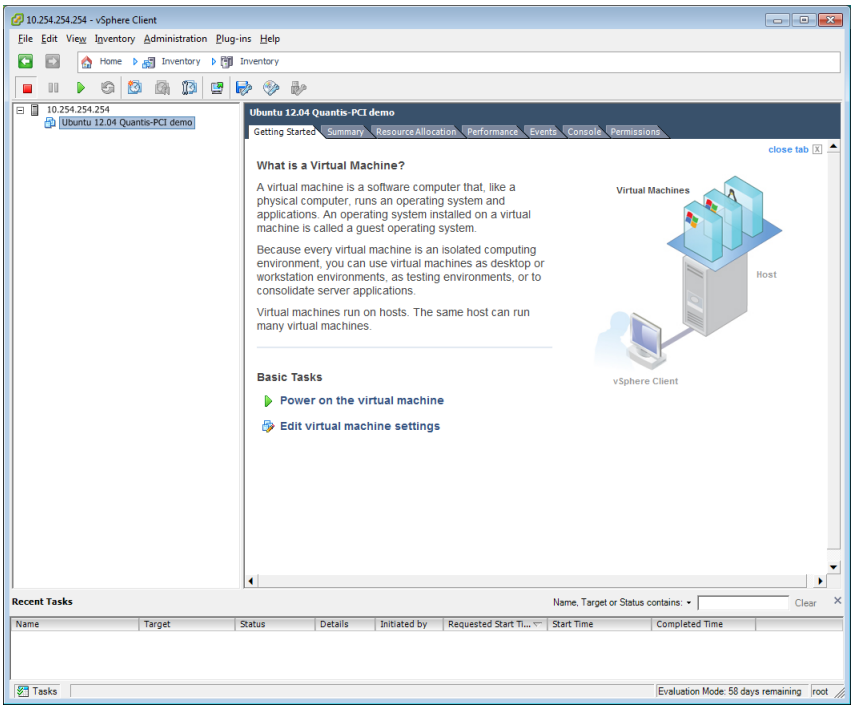
Click *Finish* to complete the wizard.


Ubuntu 12.04 Quantis-PCI demo - Virtual Machine Properties
Hardware
Options
Resources
Virtual Machine Version: 8
Show All Devices
Add...
Remove
Hardware
Summary
Memory 1024 MB
CPUs 1
Video card (edited) Video card
VMCI device Restricted
SCSI controller 0 LSI Logic Parallel
Hard disk 1 Virtual Disk
CD/DVD drive 1 (edited) /vmfs/devices/cdr...
Network adapter 1 VM Network
Floppy drive 1 Client Device
New PCI Device (adding) id Quantique Quantis...
Connection
Specify the physical PCI/PCIe Device to connect to:
03:02.0 | id Quantique Quantis PCI 16Mbps
Note: the presence of a PCI/PCIe device passthrough will prevent many commands on the virtual machine. It will not be able to be suspended, to have snapshots taken or restored, or to participate in vMotion.
Help
OK
Cancel

Finally click *OK* to validate the new settings.

3.1.5. Install the Guest OS

Insert the Ubuntu CD-Rom into the host computer drive. In this example Ubuntu will be installed with default features.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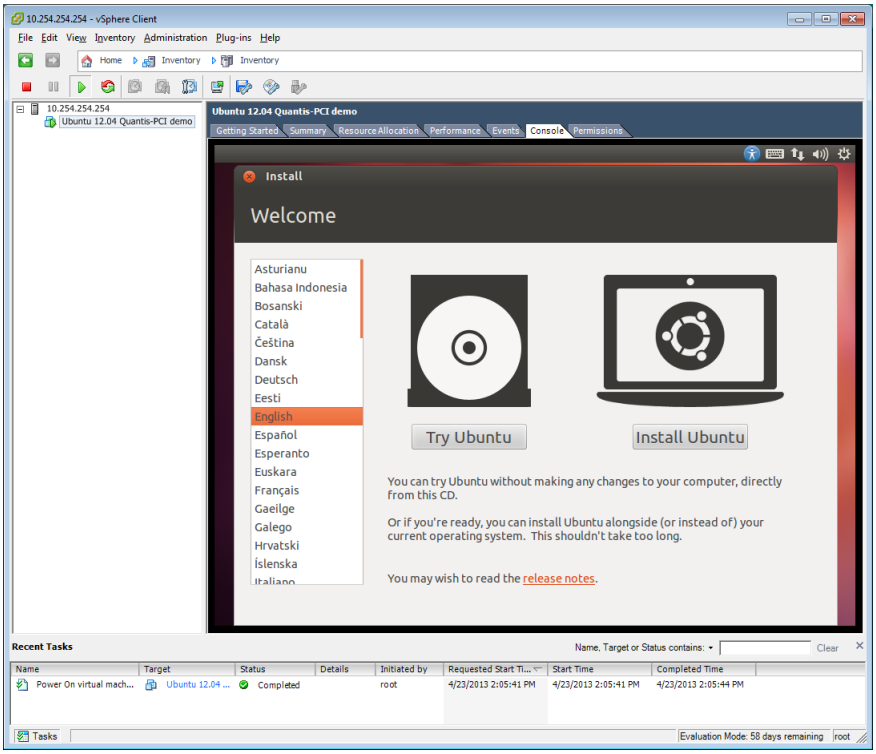
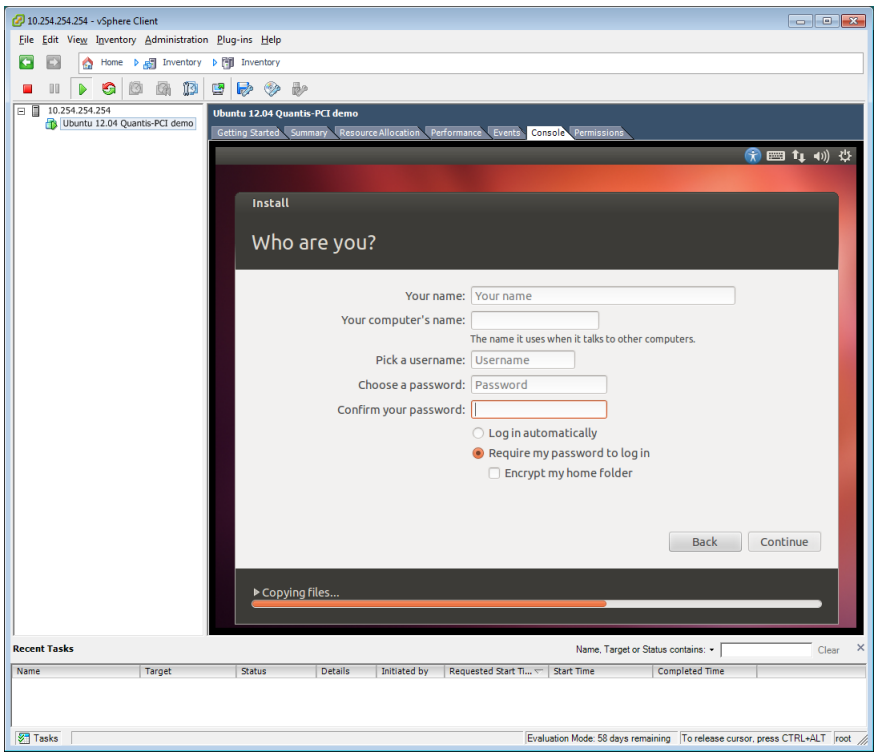
Evaluation Mode: 58 days remaining
root

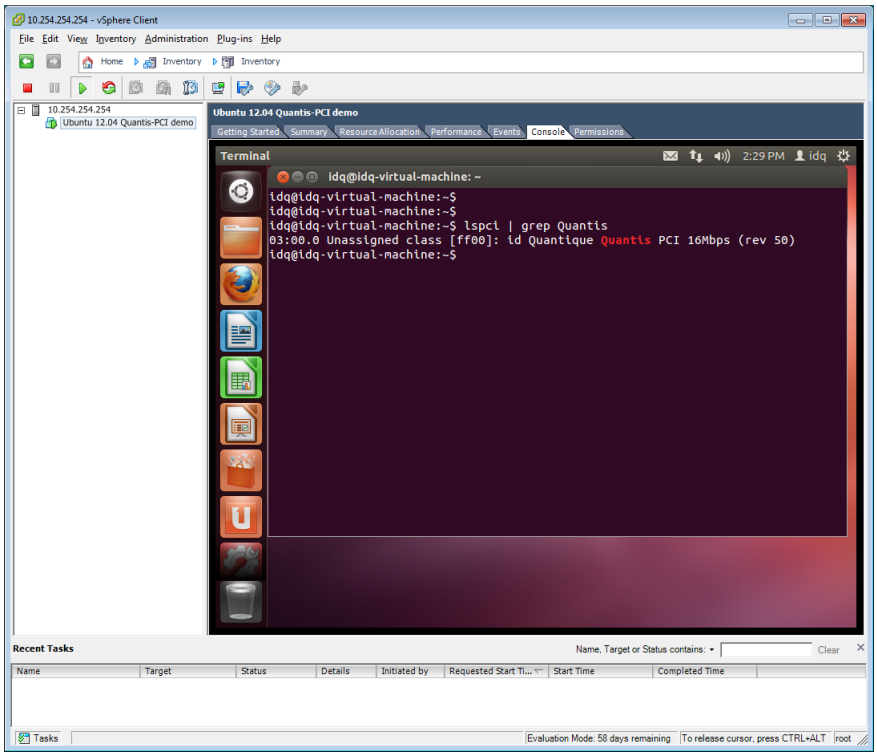
Click *Power on the virtual machine* to start. Then select the *Console* tab to visualize the virtual machine.



Click *Install Ubuntu*. On the following screens accept the default settings.



Create an account. When the installation is done, reboot the virtual machine.



Finally, after reboot open a terminal and type:

```
$ lspci | grep Quantis
```

The Quantis PCI board must be listed.

Then the Quantis kernel module and library can be installed as described in the *Quantis User Manual*.